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*of the*

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# DISEASES *of the* CHEST

VOLUME XIV

MARCH-APRIL, 1948

NUMBER 2

## S Y M P O S I U M on Diseases of the Chest

Presented at a meeting sponsored by the Laennec Society of Philadelphia and the Pennsylvania Chapter of the American College of Chest Physicians, Philadelphia, Pennsylvania, April 3, 1946.

### Scientific Session,

Martin Sokoloff, M.D., President, Laennec Society, presiding.

- \*"Changing Concepts in the Bed Rest Treatment of Tuberculosis,"  
R. S. Anderson, M.D., F.C.C.P., Erie, Pennsylvania.

"Penicillin and Streptomycin in the Treatment of Tuberculous and Non-Tuberculous Broncho-Pulmonary Disease,"  
John Kolmer, M.D., Philadelphia, Pennsylvania.

- \*"Tuberculous Disease of the Trachea and Bronchi,"  
A. R. Judd, M.D., F.C.C.P., Hamburg, Pennsylvania.

- \*"Tuberculosis Control in the Army,"  
Esmond R. Long, M.D., Philadelphia, Pennsylvania.

### Luncheon Speakers,

\*J. Winthrop Peabody, M.D., F.C.C.P., Washington, D. C.  
C. Howard Marcy, M.D., F.C.C.P., Pittsburgh, Pennsylvania.

### Scientific Session,

Ross Childerhose, M.D., F.C.C.P., President, Pennsylvania Chapter, American College of Chest Physicians, presiding.

- \*"Pulmonary Cysts,"  
Burgess Gordon, M.D., F.C.C.P., Philadelphia, Pennsylvania.

- \*"Early Clinical Features of Bronchogenic Carcinoma: Illustrative Cases,"  
Charles M. Norris, M.D., F.C.C.P., Philadelphia, Pennsylvania.

"Cytology of Bronchial Secretions in the Diagnosis of Cancer,"  
P. A. Herbut, M.D., and Louis H. Clerf, M.D., F.C.C.P., Philadelphia, Pennsylvania.

- "Bronchoscopy in Some Types of Atelectasis,"  
John S. Packard, M.D., F.C.C.P., Allenwood, Pennsylvania.

- "Differential Diagnosis of Broncho-Pulmonary Disease,"  
W. E. Chamberlain, M.D., Philadelphia, Pennsylvania.

### Dinner,

Toastmaster, Chevalier L. Jackson, M.D., F.C.C.P., Vice-President, Pennsylvania Chapter, American College of Chest Physicians, and Past-President, Laennec Society of Philadelphia.  
Speaker, Richard H. Overholt, M.D., F.C.C.P., Brookline, Mass.,  
"Lung Resection in Broncho-Pulmonary Tuberculosis."

\*These papers are published in this issue of "Diseases of the Chest."

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## Address \*

J. WINTHROP PEABODY, M.D., F.A.C.P., F.C.C.P.\*\*  
Washington, D. C.

I think that the great French internist René-Théophile-Hyacinthe Laennec would be greatly pleased if from that heaven to which all good physicians surely go he could look in upon this gathering today. He would be glad to know, that one society which bears his name and another society which bears his likeness on its seal should be meeting together in fulfillment of the purpose for which they were both organized and in the attainment of which he not only spent his life but gave his life.

The purpose of the Laennec Society of Philadelphia and of the American College of Chest Physicians, of which the Pennsylvania Chapter is a part, is the same, the advancement of knowledge concerning diseases of the chest. The great Sir William Osler once spoke of the impenetrable barrier interposed by the abdominal wall between the physician and the knowledge he must have to treat the patient aright. The similar barrier which once barred the chest physician from the knowledge he also needs has also been swept away, first by the stethoscope devised by Laennec in 1816, then 80 years afterwards, by the discovery by Roentgen of the ray which bears his name. Those two dates are mile-stones in the history of diseases of the chest. Before Laennec, it has been properly said, methods of physical examination had scarcely changed since the days of Hippocrates, except possibly to deteriorate a little. Before Roentgen, even after the physician had been made to hear by Laennec's invention, his eyes remained blinded.

It is interesting to look back on the giant strides made in diagnosis and treatment of diseases of the chest in the bare dozen years of existence of the American College of Chest Physicians. Bronchoscopy has been greatly improved. Bronchospirrometry now permits functional testing of the lung. Tomography now permits exact localization of pathologic processes. As a result of these diagnostic procedures, carcinoma of the lung and other neoplasms are now susceptible to early diagnosis, and pneumonectomy is now a practical procedure, to which many men already owe their

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\*Presented at a symposium on Diseases of the Chest, at a meeting sponsored by the Laennec Society and the Pennsylvania Chapter of the American College of Chest Physicians, Philadelphia, Pennsylvania, April 3, 1946.

\*\*Professor Diseases Respiratory System, Georgetown University.

lives, and not a surgical curiosity. Such new entities as virus pneumonia and ornithosis have been recognized and investigated. The sulfonamides and penicillin have reduced the mortality of pneumonia to a point which 10 years ago we did not dream possible, and they have enormously reduced the mortality of such formidable diseases as empyema and lung abscess, whose incidence, for that matter, they have also reduced. Finally, and in the opinion of many of us most important of all, mass tuberculosis surveys have become a reality. All of these things, as I say, have happened within the lifetime of the American College of Chest Physicians.

The College, I believe, is properly organized to take the fullest advantage of the new knowledge of diseases of the chest. It was founded to bring together men who devote all of their time, or a large portion of their time, to teaching or treatment or research investigation of diseases of the chest. It therefore includes in its membership not only internists but also thoracic surgeons, radiologists, bronchoscopists, otolaryngologists and pathologists. Requirements for election to fellowship are exacting, but within the framework of exactitude are nonetheless liberal. The aim of the society is to emphasize the relationship between physicians who specialize in diseases of the chest and physicians who engage in the general practice of medicine, while at the same time emphasizing the standards which men who are specialists must establish and maintain.

The most important function of the College is to further medical education, both post-graduate and under-graduate. All of its meetings, like this one, are in effect post-graduate assemblies. They are so planned that their value is not limited to Fellows of the College but can be shared by all physicians. The College, as a matter of fact, is founded upon a pyramid of other societies, local, state, regional and national, and this joint session, participated in by the Laennec Society of Philadelphia and the Pennsylvania Chapter of the College, has been duplicated dozens of times in many parts of the country.

Important as its post-graduate educational function is, however, the College promptly realized that a major part of its educational effort must concern the undergraduate teaching of diseases of the chest, on the concept, frequently more honored in the breach than in the observance, that the tree will incline as the twig is bent. One of its earliest efforts, therefore, was a long-term survey of the facilities and methods for the teaching of tuberculosis in the medical schools of the United States and Canada. The report of the Council on Undergraduate Medical Education was, unfortunately, pessimistic. Both facilities and methods were found to be



wholly inadequate. That the conclusion was fair and impartial is borne out by the fact that most of the deans of the colleges and the heads of the departments of medicine investigated were in complete agreement with the report of the Council. The purpose of the Council was not to criticize shortcomings but to assist in remedying them, and the teaching manual now going through the press is one way of doing so. Incidentally, when it is completed, other manuals on other diseases of the chest will follow.

A significant educational effort of the College has been the organization of state and county and city committees on tuberculosis. When the work was first undertaken, only six states had such committees. Now they are functioning in almost every state, several states have them in almost every county, and they are active in many cities. I think it fair to say that our ultimate objective, a tuberculosis committee in every local medical society, may soon be attained. It is essential that it should be. Pronouncements from high places will not solve the problem. Tuberculosis is a national and world-wide disease, it is true, but it is first of all a local problem, and its solution will come first on the local plane.

The viewpoint of the College is, however, truly international. Before the war there were Fellows in almost every country in the world, and organized chapters in several. Expansion was abruptly ended with the outbreak of hostilities in all the zones of combat, though expansion in Central and South America never ceased. The abstracts in Spanish which appear at the end of every article in the official journal, *Diseases of the Chest*, is testimony of the interest of the Fellows in the Southern countries of the Western Hemisphere. With the end of hostilities contact with Fellows and chapters elsewhere is rapidly being revived, and it cannot be revived too promptly. I need not remind you that tuberculosis is one of the plagues which ride with the Horsemen of War and Famine and Disease.

I have not meant, of course, to minimize other diseases by dwelling at such length on tuberculosis. On the other hand, while this disease may no longer be Captain of the Men of Death, it yielded that preeminence unwillingly, and it may readily regain it. We need not look further than the products of the German concentration camps to realize that.

We have made many advances in tuberculosis—pneumothorax, phrenic crushing, pneumoperitoneum, intrapleural pneumonolysis, stage thoracoplasty, lobectomy, pneumonectomy. But case finding is still the most important of all considerations, and the mass surveys already made suggest the presence in this country of perhaps 1,500,000 tuberculous subjects, which scarcely furnishes

grounds for complacency. From the standpoint of public welfare societies such as those meeting here today must rise to that diagnostic and therapeutic challenge. We must identify those persons, and we must teach them and their families, and I am afraid some of our own profession, that the old and tried, and I grant trying, method of bed rest and other supportive measures is still the basic therapy, everything else being adjunct. The earlier the disease is identified, in fact, the less do we need any other measures.

But let me go back to Laennec. I have no doubt that he would have looked at the program we are presenting today with a great deal of interest. He would have approved of papers dealing with pulmonary tuberculosis and tuberculous bronchopulmonary disease and tuberculous tracheobronchitis, for 40 years before Koch identified the organism that proved his thesis he taught that tuberculosis, wherever it was located, was a single disease. He probably would not have recognized certain of the diseases to be discussed on our afternoon program, but he was a sound pathologist—sounder, I fear, than some of us here, in which group I hurriedly place myself—and he would quickly have comprehended whatever he did not understand. But diagnosis by cytology and bronchoscopy, treatment by penicillin and streptomycin and lung resection, those things would have been beyond his knowledge at least until a good deal of background had been filled in.

Laennec achieved his medical knowledge the hard way, and it might profit us to recall how he accomplished what he did. When he was not yet 15 years of age he put away childish things and began the study of medicine. While still in his teens he was a health officer in the French Army. At the age of 20, almost penniless, he reached Paris, then the city of medical light, where the system of medical education was curiously compounded of tradition and clinical science. The curriculum included lectures on Hippocrates three times a week, but students were led from the wards to the postmortem room, their teachers were great anatomists and pathologists, and one of them, a 17-hour-a-day man, as he was described, had himself performed autopsies on more than 900 tuberculous patients.

Laennec's industry and intelligence and burning ambition quickly commended him to those men. The year he graduated he was awarded the prizes in medicine and surgery, two of the four awards offered. He wrote on such widely different subjects as cancer, melanosis, ascaris and hydatid disease. He first described the deltoid bursa, bronchiectasis, hemorrhagic pleurisy, pulmonary gangrene, pulmonary infarct, emphysema, esophagitis, interstitial hepatitis, and perforating carcinoma of the stomach. He left classic descriptions of pneumonia and bronchitis. In 1816, at the age of

35, he devised the stethoscope, which he left to his nephew when he died—ironically of tuberculosis—as “the best part of my succession.”

And so it was. For the stethoscope led to his first book on mediate auscultation, published in 1818, with a preface from the Royal Academy of Science so guardedly worded that its apparent commendation could instantly have been withdrawn if the book had failed. It did not. But Laennec, broken in health, with the first manifestations of his fatal disease upon him, had to retire from practice for two years. Then he returned to honor and fame, and to heartbreaking work on the second edition of his book, which for all practical purposes was a new book. He died in 1826, almost as soon as it came from the press. “I knew that I risked my life,” he wrote, “but the book that I am going to publish will be, I hope, of more value than the life of a man, and in consequence my duty was to finish it, whatever might happen to me.”

I need not remind you that the modern stethoscope, which the modern medical student so proudly drapes from his pocket on his first introduction to clinical medicine, began as the crude roll of paper through which Laennec 130 years ago first listened to the sounds within the chest. I need not remind you that the whole modern concept of diseases of the chest stems from this man's work. It is eminently proper that we pause at intervals, as we are doing today, to remind ourselves of this man and what he achieved, and to question ourselves, in all seriousness, as to whether we are making such use of our magnificent equipment and our modern scientific methods and our unlimited opportunities which this young country boy made of the poor tools of his medically benighted day.

I doubt that we are. The roentgen-ray has not officially replaced the stethoscope, but I sometimes wonder, as I see patients in consultation, whether that is not about to happen. It is the business of our two societies to see to it that it does not. We must utilize all the resources of modern medicine, but we must use them wisely and intelligently, and we must remember, and see to it that students are made to remember, that God gave us eyes and ears and fingers before man devised the x-ray machine and other auxiliary methods.

One way to achieve that end is by the continuation of such meetings as these, where men of good will, with specialized interests, meet to exchange their knowledge and experience and to learn from each other. And so I end as I began. I think Laennec would like to be here today.

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## Changing Concepts in the Bed Rest Treatment of Tuberculosis\*

R. S. ANDERSON, M.D., F.C.C.P.\*\*  
Erie, Pennsylvania

It would be a rare experience, indeed, to discover a phthsiologist today who will frankly admit a disbelief in the therapeutic value of bed rest in the treatment of pulmonary tuberculosis. Yet, despite the volumina of printed and spoken word on the subject in the past half century there is still considerable divergence in the mode of its application clinically. The logical ascendancy of surgical measures and so-called collapse therapy in recent decades has seemingly distracted our interest from the basic principle of rest in bed. This is not to say that it is seldom employed because, on the contrary, bed rest is probably used nearly as much today as previously. When it is considered that rest is the very basis for our entire therapy, far too little thought is given it in the medical literature of the day.

Historically, the use of rest in tuberculosis is about as old as medicine itself. From the time of Galen and Hippocrates down through the ages to the premodern era rest and relaxation have played an occasional part in the management of the consumptive. Its use, however, was rarely in the definitive sense and usually occurred coincidental to some other prescribed form of treatment. Commending the tuberculous patient to a short sea voyage or a sojourn in the country, for example, often no doubt resulted in some measure of rest. Deprived of his customary pursuits the tuberculous individual was disposed to rest by sheer force of circumstances more than he had previously in his normal habitat.

It may be a whimsical commentary on such observations to recall Thomas Sydenham's practice of keeping his phthysical patients in the saddle for as many hours each day as horse and rider could tolerate. By contrast with the then not un-common prescription of long walks in the hills this custom probably constituted a modified form of rest. Lawrason Brown observed that the practice followed Sydenham for nearly a century. Those familiar with Trudeau's autobiography will recall that the eminent

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Dr. Janeway, on corroborating the diagnosis of pulmonary tuberculosis in Trudeau's chest, advised him "to go South, stay out in the open, and ride horseback."

In the nineteenth century, two hundred years after Sydenham, Peter Dettweiler was the first to really grasp the significance of rest in the therapeutics of this disease. Popularization of Dettweiler's principles based on his work under Brehmer at Gorberdorf and later in his own institution in Falkenstein, Germany, constituted one of the less heralded milestones in the long campaign against the ancient plague.

A decade later Edward Livingston Trudeau, established the Adirondack Cottage Sanatorium and instituted a regimen which placed high store on the value of general body rest. Unfortunately, the magnitude of Trudeau's genius and personality together with the amazing innovation which he had set up in that scenic locale of lakes and mountains have obscured the significance of Trudeau's experience with the principle of rest in the treatment of his own case of tuberculosis as well as that of his patients. In other respects, enthusiasts in many parts of the country were prompt to emulate the Saranac Lake experiment as closely as possible. High wooded areas were selected for the erection of cottage sanatoria, patterned after the Adirondack motif. Emphasis in treatment was placed on the environment and the "out of door life" rather than specifically on rest. Relaxation periods, principally in reclining chairs, alternating with out-door walks and an endless round of hyper-alimentation, often to the point of nausea, constituted the roster of the day. Rest was looked upon as a valuable adjuvant capable only of refreshing the patient and tending to restore his vitality.

The foregoing period persisted for ten or twenty years and more after the turn of the century. In fact, as late as the year 1918 Joseph Pratt<sup>1</sup> found it necessary to publish a paper entitled "The Importance of Prolonged Bed Rest in the Treatment of Pulmonary Tuberculosis." The editor of the American Review of Tuberculosis, the late Allen Krause, was so impressed with Pratt's timely contribution that he published an editorial on the subject in the same issue of the Review. Said Krause,<sup>2</sup> "Until the time comes when every tuberculosis patient, upon being asked what is the most important element in the treatment of tuberculosis will unhesitatingly answer 'Rest' the subject will always be timely. This happy day has not yet arrived. Today (1918) almost thirty-three years after Trudeau set down his first patient on the small porch of the Little Red, 'fresh air' and 'putting on weight' still dominates the therapeutic field."

Despite these warnings many leaders continued to regard rest



as an expedient to be used only when the patient is febrile or otherwise afflicted with symptoms of frankly progressive disease. The writings of Maurice Fishberg<sup>3</sup> illustrate the prevalence of this conception as of the year 1922. "It is clear" wrote Fishberg, "that all active cases with fever, tachycardia, anorexia, emaciation, weakness, etc., are to be kept strictly at rest until most of these symptoms have disappeared." He further stated, "the rate of the pulse is as good an index of the fitness of the patient to work as there is."

It was about this time, that is, in the early 1920's that the more general use of roentgenological examinations came into practice. With improvement in x-ray equipment and technique, and particularly with the epic-making interpretative studies of Dunham, Cole, Amberson, Heise and Samson in this country and investigators such as Kupperle and Graff and others in Europe our conception of the mode of progression and retrogression of tuberculous pulmonary lesions became far more accurate than previous clinical methods had ever been able to reveal.

As a direct result of these developments in the field of x-ray and, to a lesser extent, to a broadening and refinement of clinical laboratory techniques, the need of prolonged bed rest was clearly demonstrated. Cavities could many times be visualized in the lungs where physical signs aroused no suspicion of their presence. Extensive pathological change could be witnessed in the presence of little or no untoward symptomatology. There is little reason to wonder, therefore, why revolutionary changes in the management of the active cases of tuberculosis followed these developments in methods of precision.

By 1930 a considerable percentage of American sanatoria had so modified their treatment methods that prolonged bed rest became the rule, although it must be observed that some institutions patronized the principle more in theory than in practice. Other sanatoria continued to place emphasis in treatment on the old motif of environment and a well routinized life rather than on the generally accepted modality of rest.

For the sake of clarity, it should be stated here that this thesis is not to be construed as depreciating the great value of such factors in treatment as fresh air in a wholesome environment or an adequate dietetic regimen, etc. In fact, the essayist is old-fashioned enough to regret the elimination of "cure porches" in the modern architectural designing of sanatoria. Oxygen supply and air conditioning in their broadest meaning do not constitute the summation of all the apparent benefits of life in the open air. Among other things, there is a psychological factor present on the open porch which no amount of residence in an indoor ward

can provide, despite the proficiency of modern ventilation engineers. This is particularly true during the milder months of the year when the panorama of the seasons has its greatest appeal. Nevertheless, it is the opinion of many authorities that the single factor of rest in bed surpasses all of these considerations in importance to recovery.

The perfections realized in the field of roentgenology also demonstrated the great need for local measures to be applied directly to the chest. Thus, it was not until 1930 or shortly thereafter that such methods became universally employed to any considerable degree. With the widespread use of pneumothorax and the more strictly surgical methods of collapse the role of general body rest was again partially submerged in the massive literature pertaining to these newer methods. The effect has been somewhat paradoxical.

In many instances those who were most enthusiastic in the use of collapse therapy became also more convinced of the great value of prolonged, twenty-four hour per day rest in bed. They seemed to conclude, and no doubt with some logic, that if local rest to the lung can accomplish so much of value, generalized rest must likewise furnish something of importance. On the other hand, others took the position that collapse therapy eliminated much of the necessity of prolonged rest in bed and guided the clinical course of their patients accordingly.

It is noteworthy that there has been but little published on the value of an intensive collapse therapy program in the absence of the concomitant use of prolonged bed rest. Yet, various institutions are endeavoring to treat patients in just that manner as will be discussed in this paper. On the other side of the picture, many collapse therapy results supported by an intense use of generalized rest have been published.

In 1937, for example, Leslie and Anderson<sup>4</sup> reported the results in a study covering 1124 patients in 78.8 per cent of whom various forms of collapse measures had been employed. On discharge 48.8 per cent were classified as "arrested" or "apparently arrested" which is commendable in view of the fact that 89 per cent of the group were in the advanced stages of the disease on admission. Leslie and Anderson compared their results to the Jessamine Whitney<sup>5</sup> N.T.A. statistics which covered 42,107 patients in 278 Civilian Sanatoria for the year 1931. Among the latter group it is estimated that only ten per cent of this huge number of patients received collapse therapy and prolonged bed-rest was employed in these institutions in a greatly varied manner. Whitney discovered only 17 per cent arrested or apparently arrested against Leslie and Anderson's 48.8 per cent. In a much smaller series than the latter but with treatment very similar to that of the Leslie

and Anderson group, Hanna<sup>6</sup> reported arrestment or apparent arrestment in 54.9 per cent of admissions. The foregoing studies have been quoted many times in the past in support of the principle of collapse therapy. It should be emphasized that part of the credit is due the basic program of bed-rest employed.

In 1927 the large William H. Mayberry Sanatorium<sup>7</sup> at Northville, Michigan was using a very makeshift system of bed rest, and collapse therapy in only twenty per cent of admissions. Shortly thereafter this institution reorganized and resorted to a rigid program of bed rest for unstable lesions, etc. The use of pneumothorax and surgical collapse was increased to 77.7 per cent of admissions instead of 20 per cent. In four years the percentage of "apparently arrested" (this institution apparently did not employ the term "arrested") rose from 8.1 to 34.1 per cent.

In a similar manner Jerome Head<sup>8</sup> compared improvement in results in a series of 600 patients at the Edward Sanatorium treated with 24-hour rest and with collapse therapy used in 60 per cent to an earlier group treated with only partial bed rest and collapse in but 10 per cent. The earlier group were reviewed six years after discharge and 27 per cent were found well, 51 per cent had died and in the balance the condition was unknown. In the later or more intensely treated group, reviewed after a period varying from three to eight years subsequent to discharge, 96 per cent of the minimal cases were well as compared to 59 per cent of the earlier series. In the moderately advanced classification the figures were 83 and 45 per cent respectively, and in the far advanced cases 41 per cent were well for the last group and only 15 per cent for the earlier series at the time of their respective follow-up studies. There were far fewer deaths found in the follow-up of the more recent group compared to that of the six-year review of the earlier series.

The encouraging sequelae of treatment as noted in these various reports not only reflects the increased use of collapse therapy in the forementioned institutions, but we must also reckon with the fact that all of the sanatoria cited employed close to 24-hour bed rest over a prolonged portion of the hospital residency, regardless of whether or not collapse measures were used or when they were used in the individual case. It would be most difficult, of course, to accurately evaluate the proportionate good effects of generalized body rest and local functional rest of the lungs in such studies.

Fales and Beaudet<sup>9</sup> published several papers on the ability of bed rest alone to close cavities, particularly those which were young and with non-rigid walls. In two series totalling 237 cavities, he observed that 66 per cent healed on the bed rest regimen

alone without resort to pneumothorax or surgery. Older and more productive cavities healed in 43 per cent of Fales and Beaudet's groups, and fibrotic cavities in only 17 per cent.

It is not germane to this discussion to enter here into the debatable subject of just when collapse therapy should be employed in the course of treatment. One might observe, however, that the more rigid indications for the induction as well as abandonment of pneumothorax which are now recognized and which have been so fully discussed of late by Rafferty<sup>10</sup> would make it inadvisable to long deny properly selected patients the benefits of pneumothorax even though bed rest alone might eventually close their cavities. Nevertheless, Fales has clearly demonstrated the value of bed rest as a fundamental consideration. The writer is disposed to agree in the main with his observation that, "Rest treatment means to some,—rest in bed eight hours at night, one or two hours rest in the morning and one or two in the afternoon, the patient being left to his own devices the remainder of the time. To others it means absolute control and supervision during the entire 24 hours, with rest ranging from 22 to 24 hours in bed, and absolute rest where response is slow to lesser amounts. Only those who adapt the latter regimen can expect consistent results from rest in the healing of cavities."

All who carefully employ bed rest during the early months of treatment are impressed with certain clinical observations. Those patients who cooperate, relax and rest well in bed—other things being comparable—do better on the average than the patient who either cheats or will not or cannot relax and spends his days with no end of muscular and mental expenditure of energy though he nominally is a bed-patient. We all have been impressed at times with the greatly improved progress such restless fellows exhibit when they are finally prevailed upon to rest properly. Sometimes, as has often been said, the fright occasioned by a brisk hemoptysis is a blessing in disguise for these individuals.

There are other approaches for assessing the value of continued body rest. To illustrate, in the early studies of Leslie and Anderson, there was included a patient who presented a huge excavation involving almost an entire upper lobe. Her pulmonary disease was complicated by an advanced upper thoracic tuberculous spondylitis with para-vertebral abscess. With no hope of realizing a recovery, this woman was placed on a Bradford frame to immobilize her spine and afford a degree of comfort in that region during the remaining months of her life. After many weeks of this treatment the hospital staff was astounded to note that the Potts disease had not only stabilized sufficiently to warrant surgical fusion but the huge pulmonary cavity had greatly reduced



in size and later disappeared. She was eventually discharged as an "apparently arrested" case.

Less dramatic but striking results were later observed on a fair number of patients with advanced pulmonary lesions complicated by Potts disease and similarly treated. The staff at this hospital, The Michigan State Sanatorium, were so impressed with these observations that the Bradford frame treatment was used in a number of advanced pulmonary cases in whom there was no complicating bone lesions but whose very advanced pulmonary disease could not be treated effectively by collapse therapy. LeBoe and Leslie<sup>11</sup> have collected around sixty cases treated on Bradford frames, both with and without spinal lesions. Due to the War this study has not been published but LeBoe states that the results were good in fifty to sixty per cent of the predominantly exudative cases found among the group. This method of treatment constitutes an extreme degree of general rest.

Unexpected and quite similar results have been experienced at the Erie County (Pennsylvania) Tuberculosis Hospital in a small series of individuals with advanced pulmonary lesions complicated by bone lesions treated with plaster body casts for periods of many months. The series is too small at this time to enumerate in detail and will probably warrant critical study later when there are more such cases to present.

Another illustration of enforced general and local rest is the small series of cases which Barach<sup>12</sup> has treated in an equalizing alternating pressure chamber similar to the original Thurnberg apparatus. By alternating variations in pressure, respiration is carried on with very little or no movement of the muscles of respiration. The five cases so treated over a period of several months were advanced cavity cases unsuitable for collapse therapy. Remarkably encouraging results were experienced in four of the five patients acclimated to the Thurnberg Chamber and who showed little or no improvement with ordinary treatment.

These several series are not large enough to warrant sweeping conclusions to be drawn from them. Nevertheless, they all tend to support the position of those who believe in the necessity of prolonged general rest. Those of us who adhere to that point of view are conscious of the limitations of bed rest and the innumerable difficulties in keeping such treatment in force. The dangers of inadequate cavity drainage by an extreme and injudicious use of bed rest so aptly described by Peck and Willis<sup>13</sup> of late are fully realized. This applies equally to the futility of holding down continuously in bed certain "good chronics,"—to use Lawrason Brown's term,—who suffer from extensive fibrosis and emphysema and in whom curative results cannot be reasonably anti-



cipated. Similar judgment should be used as indicated with the infirm aged and those who for psychosomatic reasons cannot tolerate a severely restricted regimen. Then too, one is always confronted with the perennial dilemma of the bed-pan; whether it involves less exercise to use a bedside commode, or to be wheeled to and from a toilet than to struggle with the physical laws of balance and gravity trying to utilize a pan in bed. While these and other considerations often create permissible exceptions, they should not compromise the fundamental principle with the vast majority of patients.

At the outset of this paper it was submitted that we are still not in agreement as to the clinical application of the bed rest principal. A surprising number of institutions, it should be noted, do not employ rest as has been outlined in this discussion. With the exception of those who are symptomatically ill, the patients are permitted considerable physical activity within and around the institutions premises. As Fales observed 11 years ago, a few scheduled rest periods during the daytime are substituted for continuous bed rest. The balance of the time witnesses the expenditure of variable amounts of muscular energy with its concomitant increases in pulmonary function. Many patients in these institutions have never known a prolonged period of twenty-four hour daily bed rest as practiced in the institutions referred to above. Young individuals with open cavities and recent progressive disease and even repeated hemoptyses are frequently administered pneumothorax and placed on a semi-ambulant schedule within a matter of days to a few short weeks thereafter. Newly admitted cases in such sanatoria are often forced to walk through long corridors and up and down stairways to report for various examinations, treatments, and the like. Having patients with active tuberculosis bathe themselves, make their own beds, shampoo their own heads, and even do some of their own personal laundry is an altogether false and too common method of holding down budgets in tax-supported institutions designed solely for the proper treatment, recovery and rehabilitation of the tuberculous.

It is patently understandable why there is a paucity of medical reports on such methods from these institutions. In view of this lack and in lieu of an adequate survey of all tuberculosis institutions in the nation in regard to this matter, the above assertions cannot be varified statistically. Be that as it may, it is a matter of wide knowledge that these variations in the practical use of bed rest do in fact exist.

A few short months ago, Dr. Harry A. Bray<sup>14</sup> of the RayBrook Sanatorium published a critique of the results of strict bed rest as compared to partial rest in the treatment of patients with

minimal disease. He quoted J. Burns Amberson's article of 1937 in which the results of over 100 cases with early infiltrates treated for three or four months by strict bed rest are presented. Amberson reported "lasting cure" in 90 per cent. Bray asserts that this is in no way superior to the results at the Trudeau Sanatorium published in 1922 by Brown and Heise wherein strict bed rest was employed at no time. He further points out that Brown and Heise's "minimal" cases had actually more extensive involvement than Amberson's "early infiltrates."

Bray bolsters his contention with a comparative statistical study of two groups of minimal cases treated at the Ray Brook Sanatorium between 1939 and 1942. These totaled 360 patients, 97 of whom had previously received an average of four months bed rest shortly before admission to Ray Brook. Following admission to that sanatorium they were treated as the remaining 263 cases of the study had been handled from the first; that is, on partial rest only. The two groups were otherwise reasonably comparable. The classification of condition on discharge after an average duration of seven months treatment was as follows: for the original strict bed rest group 71.1 per cent arrested; and for the partial rest group 79.8 per cent arrested; apparently arrested 12.4 per cent and 11.8 per cent respectively.

Bray further explains in part: "The asymptomatic patient with incipient disease on admission to Ray Brook is under close medical supervision for a period of two weeks; he rests in bed but is allowed bathroom privileges and goes to the dining room for his meals. He then takes the cure on an open porch for several weeks after which he is placed on graduated exercise out-of-doors for specified periods ranging from five minutes to two hours daily, etc." If the foregoing results represent the average in minimal cases at Ray Brook, one cannot escape the conclusion that the modified rest program as practiced in that institution with minimal cases has been able to produce a percentage of recoveries comparable to the best of strict bed rest programs. However, corroborative studies are needed before such conclusions are valid.

Those who do not employ strict bed rest in the early months of treatment in routine cases with unstable lesions apparently conceive of the rest principal as only an adjuvant which assists in the building up of systemic vitality and resistance and which tends to restore reserve energy against the destructive potentialities of the tuberculous infection. In a measure, they seemingly do not believe that the quieting of pulmonary function resulting from reasonably continuous twenty-four hour daily confinement to bed is an important or essential factor in therapy.

Bray dismisses it with the curious observation that, "The only physical agent acting on the lung is tension resulting from expansion of the healthy parts of the lung." He offers certain observations which lead him to conclude that "the often expressed opinion that deep breathing may tear the wall of a tubercle is open to question." Be that as it may, there remains much reason to suspect that varying tensions of the lung caused by excessive breathing is not the only *modus operandi* in which exercise may mechanically affect the course of pulmonary tuberculosis.

Coryllos<sup>15</sup> postulated years ago that reduction in lung function by rest diminishes the oxygen supply to tuberculous tissues. The resulting relative anoxia tends to inhibit the normal functions of the anacrobic mycobacterium of tubercle. Whether this theory has anything to support it, there can be little doubt that tissue anoxic states augment the development of fibrosis. Is there not, also, an increasing vascular stasis in pulmonary tuberculous tissues which have been permitted to remain as closely as possible to a functional resting state? Then, too, one must not overlook the effect on lymph flow in tuberculous tissue in the presence of exercise as compared to rest. With increased function there is an accelerated rate of absorption of the waste products of the disease including the tuberculin fractions so important to allergy considerations. Amberson<sup>16</sup> contends that since caseation heals by encapsulation this process is aided by a lessened diffusion of toxins from the tuberculous tissues. He felt that decreased lung movements occasioned by rest was important in this process.

Similarly, Rich<sup>17</sup> has stated that "it is not difficult to understand that the increased movement of the lungs associated with the greater respiratory activity during physical exertion can act mechanically to rupture partly caseous blood vessels and the necrotic margins of lesions, leading to hemorrhage and to the mechanical spreading of bacilli. Caseous material, impregnated with tuberculo-protein, may be dislodged and transferred mechanically to other sites, leading to a spread of the infection and to the production of damaging hypersensitive reactions in previously normal tissue." He further states, "That over-exertion may cause an increased absorption of tuberculo-protein as indicated by the fact that signs and symptoms that result from physical overstrain in a tuberculous patient are ordinarily quite like those of a constitutional tuberculin reaction. This familiar fact was stressed years ago by Patterson."

It is an elementary physiological principle so aptly stated by McLeod<sup>18</sup> that, "The condition in which increased heart rate occurs with greatest certainty is muscular exercise." With increased heart rate occurs increased venous return and increased

pulmonary circulation. It would seem reasonable that the latter state increases rather proportionately the chances for hematogenous dissemination of tubercle organisms. There is similar reason to believe that the increased bronchial function which is part and parcel of increased respiratory activity can be a factor in a greater incidence of bronchogenic spreads of the disease. This would be of greatest importance at times when resistance had temporarily ebbed.

Admittedly, the precise manner in which a lessened intensity of pulmonary and cardio-respiratory function enhances healing of broncho-pulmonary and pleural tuberculous lesions has yet to be clearly demonstrated. Nevertheless, there exists too great a mass of evidence in support of that belief to deny that healing is so favored. It may be that the specific factor or factors are important in direct proportion to the extent of unstable pathologic areas in the lungs and elsewhere. If so, this might account for Bray's apparent favorable results on partial rest with minimal cases, wherein the same methods of treatment are apparently damaging to patients with greater pulmonary involvement.

#### CONCLUSION

This discussion lends itself to several conclusions. It is apparent that the principal of twenty-four hour bed-rest for unstable cases of tuberculosis is not uniformly accepted and practiced in this country. This is particularly regrettable at a time when promising research is developing in the direction of specific therapy. Should an anti-biotic or some other agent be perfected which will act in a more or less specific manner against tuberculous lesions, it is highly probable that rest and resort to local collapse measures will still be required as the basic forms of treatment as they are at present. Exudative lesions are the most likely type to respond to specific therapy. When it is considered that much of the tuberculous pathology encountered clinically is predominantly of a mixed or productive type of lesion, it should be apparent that so-called "specific" will have definite limitations in therapy of this disease.

It would seem, therefore, that before our therapeutic armamentarium becomes further implemented that this matter of the basic therapy; that is, general body rest, should be clarified and to some degree standardized. Such clarification will depend on a renewed interest in the time-worn subject of rest. It will require a considerable addition to the statistical evidence on treatment with partial bed rest as compared to complete bed rest. There is also a continued need for an augmented knowledge of the effects of tuberculous disease on the physiology of the lungs, and the effects



of rest in contrast to exercise upon this altered physiology. Adequate research in this field has been long overdue.

#### SUMMARY

1) A brief historical review of the rest principal in the treatment of tuberculosis is given.

2) It is postulated that there exists in the tuberculosis hospitals and sanatoria of the United States a wide divergence in the practical application of the basic principal of general body rest.

3) The value of twenty-four hour daily bed rest as compared to partial bed rest for cases with unstable lesions is advocated. Statistical evidence pro and con this point of view are discussed.

4) Various theories relative to the manner in which general body rest mechanically effects pathologic lesions of the lungs are suggested.

5) It is concluded that as we approach the age of "specific" or "partial specifics" in the therapy of tuberculosis, bed-rest, the basic form of treatment should be placed on a more uniform and scientifically developed basis. A plea is made for a renewed interest in the subject.

#### RESUMEN

1) Se presenta una breve revista histórica sobre el principio del descanso en el tratamiento de la tuberculosis.

2) Se sostiene que en los hospitales y sanatorios para tuberculosos de los Estados Unidos existe una gran diferencia en la aplicación práctica del principio fundamental de descanso general para el cuerpo.

3) Se aboga por el valor del descanso en cama por veinte y cuatro horas diarias, comparado con el descanso parcial en cama, para casos con lesiones inestables. Se discuten los datos estadísticos tanto favorables como opuestos a este punto de vista.

4) Se sugieren varias teorías relativas a la manera cómo el descanso general del cuerpo afecta mecánicamente las lesiones patológicas en los pulmones.

5) Se concluye que ya que nos acercamos a la época de un "específico" o de "específicos parciales" en la terapia de la tuberculosis, el descanso en cama, tratamiento fundamental, debe situarse sobre una base más uniforme y científica. Se ruega que se renueve el interés sobre este asunto.

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## Tuberculous Disease of the Trachea and Bronchi\*

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Tracheobronchial tuberculosis is undoubtedly as old as tuberculosis itself. However it is only within comparatively recent times that our attention has been focused upon the fact that this manifestation of tuberculosis is of vital clinical importance to the Phthisiologist.

Pathologists have recognized the condition for some time, but clinically this complication has been accorded little consideration up until approximately the past decade. Eloesser<sup>5</sup> in 1934 pioneered with an excellent discussion on stenotic lesions of the trachea and bronchi. Samson<sup>10</sup> in 1936, Barnwell, Littig and Culp<sup>2</sup> in 1937, Warren, Hammond and Tuttle<sup>12</sup> in 1938 and others<sup>7,9</sup> through their several contributions have done much to stimulate interest and study in endobronchial tuberculosis.

The treatment of this condition has been widely discussed in the literature by numerous investigators including, Alexander and his coworkers,<sup>1</sup> Chamberlain and Gordon,<sup>3</sup> Dolley and Jones,<sup>4</sup> Tuttle and his coworkers,<sup>11</sup> and many others. All have contributed to our knowledge of the difficulties, complexities and successful methods available for the treatment of the tuberculous individual and the tuberculous infections of the bronchi and trachea.

Myerson<sup>7</sup> states that "... none of my patients have died because of the immediate effects of the bronchial lesions." He further declares that pneumothorax is superfluous, and that local treatment of the ulcer is of no value. Chamberlain<sup>3</sup> states that endobronchial tuberculosis tends to run a self limited course. These statements are not clear but if they are meant to imply that an ulcerative endobronchial lesion is not a serious complication, experiences in this clinic cannot bear out those observations, unless it is possible that the authors had in mind only those nonulcerating, eroded or extrabronchial lesions which will be described more fully further on in this communication.

Tuberculous tracheobronchitis is not a distinct isolated disease entity, but is a distinct local manifestation of an infection that is essentially systemic in nature. The clinical conception and

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management of the disease, therefore, must be formulated in terms of the local lesion on the one hand, and of the disease in general, on the other.

Chevalier Jackson, through the development of the bronchoscope, has provided the thoracologist with an instrument whereby the tracheobronchial tree may be observed and studied, the living pathological changes noted and appropriate treatment measures applied whenever possible. It is only within comparatively recent years that the bronchoscope has been used to any great extent in the treatment of tuberculous patients, therefore our knowledge concerning the tuberculous lesions of the tracheobronchial tree from the endoscopic standpoint is to a great extent either fragmentary or confused. Heretofore much emphasis has been directed against the management and treatment of the advanced and ulcerating and the stenotic lesions, with the result that considerable skepticism pervades the profession relative to the results of treatment and proper methods to be applied. When the disease has progressed to the point of advanced ulceration or stenosis, irreversible changes have taken place in the bronchial walls. Treatment must be energetic, and very frequently the methods employed must be of a permanent nature, such as thoracoplasty,

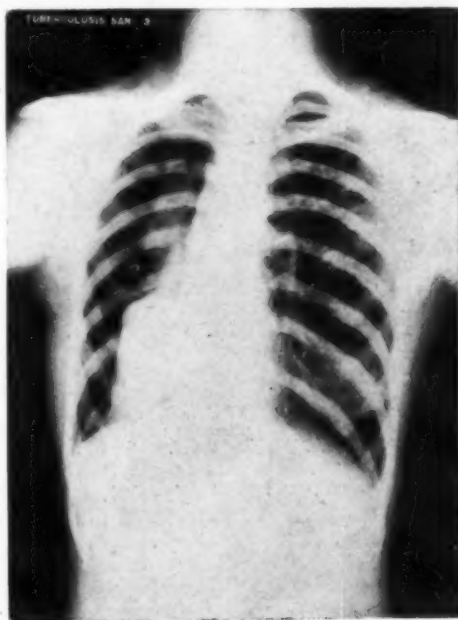


FIGURE 1: S.K., age 24. Typical roentgenogram showing atelectatic right lung occurring in a patient having all the classical symptoms of a stenotic endobronchial lesion, but unrecognized for many months. The patient died as a result of an obstructing tracheal stenosis soon after this x-ray film was made.

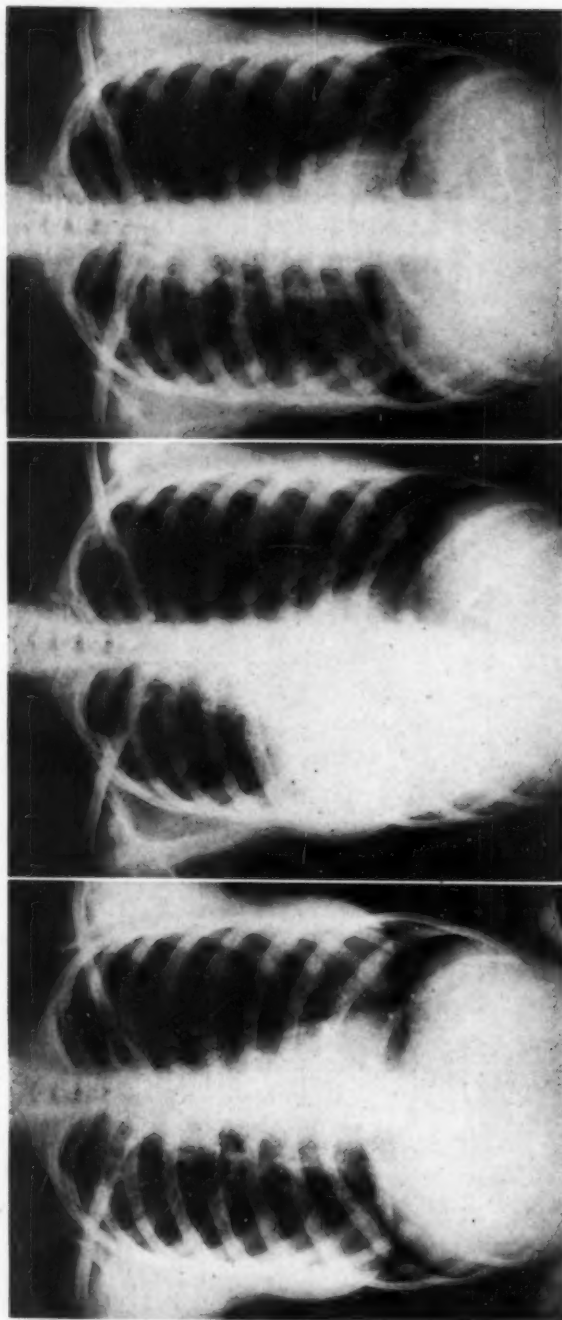


FIGURE 2: (a), J. S., age 26. Roentgenogram showing diffuse tuberculous involvement of right lung (June 15, 1945). FIGURE 2: (b), Same patient (July 20, 1945). Atelectasis of right lower lobe occurring suddenly, no collapse therapy having been attempted. A severe temperature elevation was present, but no symptoms with reference to the bronchi were elicited.—FIGURE 2: (c), Same patient (August 6, 1945). Following removal of large free mass of granulomatous tissue from the right lower lobe bronchus and discovery of large ulcerating and early stenosing lesion in the main stem bronchus near the carina.



lobectomy or pneumonectomy. It therefore becomes imperative, first, that we have a thorough knowledge of the underlying changes that ultimately lead to advanced stenotic changes in the bronchial walls, and secondly, that the endobronchial lesions be discovered as early as possible and treatment instituted.

The classical symptoms, particularly wheezing, are seldom if ever present in the early stages of the disease and generally are destined to appear only as the diameter of the lumen of the involved bronchus or trachea becomes narrowed (Fig. I). Symptoms, however, when present may vary from the very mildest to the most severe: cough, mild to exhausting in type; wheezing and dyspnoea, similarly slight to severe, are characteristic of advanced changes in the main stem bronchi or trachea. The average case, however, usually has a moderate productive cough, the sputum somewhat characteristically may be intermittantly positive and negative, but as the ulcerative process advances, a persistantly positive sputum becomes the rule. Occasional streaking and frank haemoptysis may likewise be encountered. In general, it may be stated that the symptoms will be proportional to the degree and character of the lesion, being most severe in stenotic and occluding types, and becoming most critical in the high grade strictures and occlusions of the trachea.

The roentgen findings and the extent of the endobronchial lesion usually show no definite correlation. Partial obstruction or definite limitation of the airway can be present without roentgen evidence of atelectasis (Figs. IIa and IIc). On the other hand it is also possible that the x-ray will reveal evidence of an atelectasis of all or part of one lung without the patient being aware of any significant symptoms suggestive of tuberculous tracheobronchitis (Fig. IIb).

The principal localizing symptoms and signs suggesting tracheobronchial tuberculosis, however, include the following:

1. Periodic variations in the character and in the amount of sputum. Although this feature may occur in the presence of non-obstructing lesions, it is considered more characteristic of the obstructed or partially obstructed bronchi.

2. Sputum, alternately positive and negative for acid fast bacilli, especially if such occurs at a time when the x-ray examinations show the parenchymal infection to be under control or actually show an absence of a parenchymal involvement.

3. Inspiratory and expiratory wheeze or stridor occurring in a patient with a positive sputum, or in a patient after sputum conversion. Although most common in tuberculous patients, a wheeze, or stridor may occur in the nontuberculous, but in any event a bronchoscopic investigation is indicated.

4. A difficulty in raising sputum particularly in the presence of a persistent cough that is difficult to control.

5. Streaked sputum, or haemoptysis, occurring in the absence of definite active pulmonary tuberculosis (or other disease processes), or in the presence of an apparently controlled parenchymal disease, is suggestive and likewise should be investigated.

6. Unexplained dyspnea, with or without an accompanying cyanosis. This cyanosis if present is generally out of proportion to apparent existing disease.

7. Roentgen evidence of unexplained lung density (atelectasis) occurring in the tuberculous patient, especially after the institution of collapse therapy, particularly artificial pneumothorax.

These symptoms and signs are elicited principally, but not exclusively, in advanced cases of tracheobronchial tuberculosis. They occur rarely, if at all, in the early cases. Therefore as a bronchoscopic examination alone offers the only means for conclusive and undeniable diagnosis in the living individual, it is not amiss to suggest that only by the wide use of the bronchoscope in all collapse therapy patients will the maximum of good results be obtained in the treatment of this condition.

Etiologically the tubercle bacillus is the causative organism, however, there are unquestionably multiple underlying, fundamental factors that singly, or in multiple, combine to determine the patient in whom the process will occur and the site at which the actual ulceration takes place. Various theories have been advanced including the influence of an allergic diathesis as described by Oatway et al.<sup>8</sup> Certainly, why one tuberculous patient will develop a tuberculous endobronchitis or tracheitis, and another will not, still remains an unexplained question. Our observations have convinced us of the existence of unexplained underlying influences and the fact that intrabronchial tuberculous bronchitis in all its phases is a continuous progressive process that may become arrested at any stage, spontaneously or through the intervention of therapeutic methods, or it may, on the other hand, progress to a strangulating stenosis with subsequent death, if the offending lobe or lung can not be removed or if the trachea itself becomes stenosed.

The treatment of these lesions must follow the dictates of the specific lesion at hand. It is therefore of utmost advantage that one have a thorough conception of the dynamics and peculiarities of the process encountered. In view of this and on the basis of the observations and the studies, recently completed on 500 individual patients in our clinic, an attempt has been made to evolve a classification that will serve equally well from both the diagnostic and therapeutic standpoints. This classification has been

described in another communication<sup>6</sup> and is summarized as follows:

Group I: Extrabronchial lesions. Lesions of this group originate as a result of the rupture of an underlying focus, a caseous lymph node or a tuberculous cavity into the bronchus or trachea.

Group II: Intrabronchial lesions. This group represents all those lesions that have developed as a direct pathological process, in contrast to Group I wherein the bronchial involvement is decidedly indirect. This group is further subdivided into five types, and each type for greater clarification is still further broken down into grade 1-2-3, except type V (see table 1).

TABLE 1  
SUMMARY OF CLASSIFICATION

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Group I: Extrabronchial.

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Group II: Intrabronchial.

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Type 1: Superficial Inflammatory. Reaction . . . . .	(Grade 1)
to	
Superficial. Erosion . . . . .	(Grade 2)
Superficial Ulceration, Submucosal	
structures not invaded . . . . .	(Grade 3)
Type 2: Submucosal Tissues Invaded; Little or no	
appreciable granulation tissue . . . . .	(Grade 1)
Redundant Tissues and	
Granulation Overgrowths . . . . .	(Grade 2)
Weakening of Walls . . . . .	(Grade 3)
Type 3: Deeper Layers Invaded with	
Extensive Ulceration . . . . .	(Grade 1)
Fixation of Walls and Tissues . . . . .	(Grade 2)
Stenosis and Occlusion . . . . .	(Grade 3)
Type 4: Ulcerating Process Resolved.	
Stenosis Present:	
Degree of Occlusion Expressed as . . . . .	(Grade 1)
	(Grade 2)
	(Grade 3)
Type 5: Miliary Implantations on Mucosa.	

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Type 1: The lesions in this category include those ranging from a superficial inflammatory reaction, the superficial erosion, to the superficial ulcerations that may extend to, but not into, the submucosal structures.

Type 2: The lesions of this group include the ulcerating lesions that extend into the submucosal structures. The area of ulceration may vary in size, the zone surrounding the ulcer area may show varying degrees of tissue redundancy. Granulation overgrowth is common. In the more advanced stages (grade 3) weak-

ening of the walls may be evident. A variation or distortion of the normal circumferential contour of the bronchial outline may be present but there is no actual reduction in the size of the bronchial lumen.

Type 3: Constitutes a category embracing those lesions wherein the process has progressed into the deeper layers, is associated with a fixation of structures and in the advanced phases there is a frank stenosing, narrowing, or occlusion of the bronchus or trachea.

Type 4: Represents that group of cases, generally few in number, in which the ulcerating and inflammatory process has resolved but in which the bronchus (or trachea) is definitely narrowed and stenotic.

Type 5: Embraces a rare group of cases. The lesions are characterized by miliary implantations in the mucosa of the bronchus or trachea. However, generalized miliary tuberculosis is not implied, but parenchymal involvement may or may not be present. It is suggested that this type may provide the background upon which the endobronchial tuberculous ulcers form when there is no accompanying parenchymal disease. Direct treatment of the lesion is endoscopic, and if the endoscopic treatment is to be maximally successful, the operator must be fully acquainted not only with the several endoscopic methods and with the peculiarities of tuberculous endobronchitis but also with the various collapse therapy procedures and their effect upon the maintenance of an adequate airway and drainage.

Group I: Usually carries a very favorable prognosis with respect to the bronchus. Less energetic treatment is required than in many of those cases in Group II.

Group II: Types 1 and 2 yield most readily to routine treatment methods and the percentage that advance to the more severe manifestations is exceedingly low, especially when the endoscopic treatment can be combined with some form of collapse therapy.

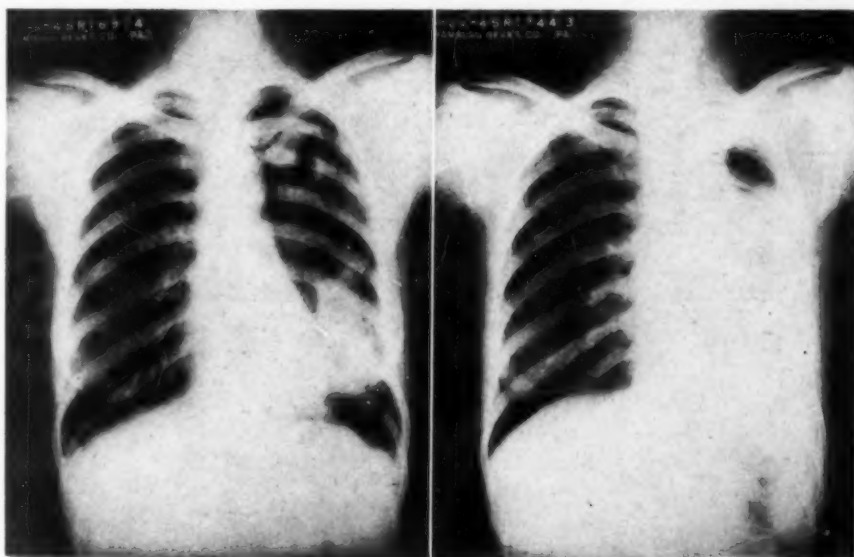
Type 3: Demands a much more energetic regimen, especially as regards to grade 2 and grade 3. Treatment in these cases is often times prolonged and difficult and not infrequently is discouraging. Type 4 comprising those cases in whom the ulceration has healed, demands no active treatment in the less severe cases, while the moderately severe cases demand periodic dilatation of the stenotic ring, and the most severe cases usually come to some form of surgical intervention. The interval between treatments and the demand for surgical intervention varies with each individual case. It is doubted, however, that dilatation can ever be abandoned and the opinion is here ventured that sooner or later



every case that demands active dilatation will sometime come to operation for the eradication of the involved pulmonary segment or lung.

Generally, the therapy of the endobronchial lesion specifically consists of repeated bronchoscopic treatments. Secretions are removed by the straight and curved tip aspirator. If the surface is simply inflamed, or is inflamed and boggy, some soothing application such as monochlorophenol with menthol, in oil, or gomenol may be applied. If the surface is eroded or ulcerated (type 2, Grade II and III), 5-10 per cent silver nitrate is applied topically. When the surface is covered over by an exudate, this is removed. Excess granulations are also removed in the same manner if possible, otherwise forceps are used. Twenty to thirty per cent silver nitrate is then likewise applied topically. In certain patients silver nitrate is not well tolerated, therefore in such instances the careful use of the actual cautery is recommended. Strictures are dilated as demanded by the individual case. Where miliary implantations represent the only manifestation present, active treatment is not required, except when there is a breakdown of any individual focus; then treatment follows the same pattern as just described.

The management of collapse therapy in the presence of endo-



(a)

(b)

FIGURE 3: (a), A.C., age 38. Roentgenogram just following institution of artificial pneumothorax for cavernous pulmonary tuberculosis (June 5, 1945). FIGURE 3: (b), Same patient (September 25, 1945). Showing atelectasis of left lung. Bronchoscopic examination revealed multiple ulcerations involving several of the smaller bronchi of the lower lobe and main upper lobe bronchus. The patient was asymptomatic with reference to the bronchi.

bronchial ulceration is oftentimes a matter demanding keen judgement. In the presence of types 1 and 2 of Group II, collapse therapy by any method indicated can be instituted with practically complete impunity from the bronchoscopic standpoint. Cases falling into the type 3 category, especially Grades II and III, often present vexing problems. Artificial pneumothorax is ill advised in many cases because of the danger that further stagnation of secretions is favored and an impending stenosis or occlusion may suddenly be precipitated (Fig. III). In some cases, regional collapse methods such as thoracoplasty or extrapleural pneumothorax or plumbage may be instituted safely while an artificial intrapleural pneumothorax in those same cases would be contraindicated. In the more advanced stenosis as represented in types 3 Grade III, and type 4 Grades II and III, collapse therapy is hazardous and on the whole it appears that the removal of the lung (or lobe) may become the procedure of choice.

#### SUMMARY AND COMMENT

In summary, it should be emphasized that tuberculous endotracheobronchitis is but a local manifestation of a systemic type of disease. The development of the endobronchial phase of the disease is a gradual process starting first with small blood vessel dilatation. This is followed by a more pronounced inflammatory reaction with cellular infiltration of the tissues, accompanied by various degrees of edema and mucosal thickening. Thus an unhealthy mucosa favors stasis of secretions and by the interaction of a number of factors the mucosa becomes eroded, actual ulceration occurs and a process whereby a frank stenosis or occlusion of the bronchus or trachea, may develop. This sequence of events may occur in any of the bronchi or in the trachea, and may be interrupted and arrested at any stage, in the majority of cases. The prognosis and outcome will then be determined by the stage at which the process is arrested; provided that the disease of the lungs can be controlled.

This condition is similar to many others in that the goal of good and effectual treatment lies first, in the early discovery of the endobronchial lesions through the wide application of bronchoscopic methods, and secondly, in the judicious use of bronchoscopic and collapse therapy procedures.

#### RESUMEN Y COMENTARIO

En resumen, debe recalcarse que la endotráqueobronquitis tuberculosa es solamente una manifestación local de una enfermedad de tipo general. El desarrollo de la fase endobronquial de la enfermedad es un proceso paulatino que se inicia con la dila-

tación de los pequeños vasos sanguíneos. Sigue a esto una reacción inflamatoria más pronunciada con infiltración celular de los tejidos, acompañada de varios grados de edema y de engrosamiento de la mucosa. De este modo una mucosa anormal favorece el estancamiento de las secreciones y, debido a la acción recíproca de un número de factores, se desgasta la mucosa, ocurre una verdadera ulceración y puede desarrollarse un proceso que resulte finalmente en una franca estenosis u oclusión del bronquio o de la tráquea. Puede ocurrir esta serie de sucesos en cualquiera de los bronquios o en la tráquea, pero en la mayoría de los casos puede interrumpirse o estacionarse en cualquier etapa. Por consiguiente, lo que determina el pronóstico y el desenlace es la etapa en que se estaciona el proceso con tal de que se pueda dominar la enfermedad en los pulmones.

Se asemeja esta condición a muchas otras en las que el objeto del tratamiento adecuado y eficaz consiste, primero, en el descubrimiento temprano de las lesiones endobronquiales mediante la extensa aplicación de métodos broncoscópicos y, segundo, en el empleo juicioso de procedimientos broncoscópicos y de colapso-terapia.

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## Tuberculosis Control in the Army\*

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Fundamental principles in the control of tuberculosis, as applied by the U. S. Army in the war just concluded have been: (1) exclusion of cases of tuberculosis at the time of induction, (2) early diagnosis and hospitalization of active cases in the Army in the course of normal medical care of troops, and (3) final check of all military personnel at the time of discharge, in order to return a tuberculosis-free population to civilian life.

The exclusion of tuberculous cases was accomplished at induction stations by mass x-ray survey, with stereoscopic 4 x 5 films as standard. Approximately 10,000,000 men accepted by the Army were examined by x-ray, after an average rejection rate of all men examined of approximately 1 per cent. Since about 18,000,000 men were examined for the armed services, the total number rejected was about 180,000.

Subsequent examinations within the Army were not routine until the time of separation from service. However, many interim examinations were made, on the basis of chest symptoms, on application for officer candidate school or special military services, and in all cases where chest disease was suspected prior to dispatch on oversea service.

The incidence of tuberculosis in the Army is reflected in the rate of admission to hospitals for observation for tuberculosis. This was high in the early days of the war, because of the original acceptance of a considerable number of men without the x-ray examination, which was later required. A rapid drop occurred in 1942, representing careful examination at induction, and the rate remained at approximately 1 per thousand men per year throughout the second half of 1942, and all of 1943, 1944 and most of 1945. Late in 1945 and throughout 1946 a definite rise occurred, coincident with a new mass survey for separation purposes.

The discharge rate was lower, since only 60 per cent of the cases admitted for observation proved to be active tuberculosis requiring separation from service. The discharge rate was thus

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approximately 0.6 per thousand men per year. The combined death rate for troops in service and men discharged from the Army, that is, World War II veterans on the rolls of the Veterans Administration, has been approximately 7 per 100,000 per year, as compared with a rate of approximately 50 for the same age group in the general population, a rate testifying to the efficiency of the induction station examinations.

Cases discovered on Army posts were sent to station hospitals and subsequently either discharged to the Veterans Administration directly or sent to Fitzsimons General Hospital for further treatment. When the overseas load became appreciable, men acquiring tuberculosis in foreign theaters were sent to Bruns General Hospital. Finally, with the load incident to separation service mass x-ray examination, the Army opened up a large tuberculosis section in Moore General Hospital.

The admission rate overseas was definitely less than that in the United States, except in recovered prisoners of war. The relatively low rate is explained by the fact that men were screened by several months of service and physical inspection prior to dispatch overseas. The higher rate in prisoners is attributed to the effects of hardship and exposure through contact with other prisoner groups with a higher rate of tuberculosis.

All personnel are required to have a physical examination, including a chest roentgenogram, at the time of separation from service. This has been accomplished at 25 regular separation centers and 150 temporary separation points. During the separation center examination approximately 1 man per thousand has been found to have tuberculosis or suspected tuberculosis requiring either treatment or observation. Cases discovered are sent to Army hospitals, and from there cases determined to be active are discharged to the Veterans Administration. At the present time the hospitals of the Veterans Administration are filled to maximum capacity, and the Army is holding about 3500 cases in its own three special tuberculosis hospitals.

#### SUMMARY

In conclusion it may be stated that the control measures as applied in the Army, with admitted imperfections due to rapidity of mobilization and military exigencies, have been effective in maintaining a population with a very low tuberculosis rate. There is every reason to believe that these measures will have a favorable effect on the whole trend of tuberculosis in this country, through the early discovery of cases, removal of sources of contagion, and the pattern of large scale observation set by the procedure followed.

### CONCLUSION

En conclusión, se puede afirmar que las medidas de control aplicadas en el Ejército, aunque reconocidamente imperfectas debido a la rapidez de la movilización y a las exigencias militares, han sido eficaces en mantener una población con un índice de tuberculosis muy bajo. Se cree con mucha razón que estas medidas ejercerán un efecto favorable sobre el curso entero de la tuberculosis en este país, mediante el descubrimiento temprano de casos, el aislamiento de fuentes de contagio y el patrón de observación en grande escala que se estableció con el procedimiento empleado.

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## Pulmonary Cysts\*

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Cystic disease of the lung, only a few years ago, was considered as a rare condition. The clinical features at first seemed bizarre and confusing, leading to mistaken diagnoses of heart disease, recurrent pneumonia, and asthma. With wider knowledge resulting from x-rays and bronchoscopy and the proved value of surgical treatment, with the well established fact that the cases are curable and not uncommon, there is a more favorable outlook and increasing interest in the subject. An important aspect, still confusing, is the question of etiology. Individual reports beginning in 1925<sup>1</sup> suggest that the largest number of cases are congenital in origin.

According to Klosk, Bernstein, and Parsonnet,<sup>2</sup> the development of congenital cysts possibly begins about the sixth month of embryonic life when branching and evagination of the lung buds become arrested, resulting in large solitary cysts. With arrest of growth, later in the course of development, multiple cysts result. Additional factors are influenced by failure of the bronchopulmonary segment to keep pace with the increased capacity of the fetal thorax, causing dilation of the involved bronchi. Congenital cysts, according to Gross,<sup>3</sup> may be solitary, globular, pedunculated, or "ballooned-out." Cysts occur most frequently within the lung substance and are apt to be multiple; some are located in front or posterior to the lung root.

The pathology of congenital cysts shows mucus-secreting, ciliated, columnar, epithelium, resting on a layer of connective tissue. When the cysts communicate with the bronchus, it is sometimes difficult to demonstrate the exact structural relationship. In some cases the lung parenchyma is replaced with large cavities and underlying cystic degeneration varying in degree from multi-locular to uni-locular cysts, occupying one or both lungs (Klosk, Bernstein, and Parsonnet).<sup>2</sup>

In the acquired form there is a possible relationship to chronic bronchitis, bronchiectasis, peribronchitis, pulmonary fibrosis, em-

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physema, bronchial asthma, repeated bouts of hard paroxysmal coughing, and such influences as loud talking and shouting in the presence of some underlying weakness of the part. Fundamentally, the acquired pulmonary cysts result, or are, associated with an inflammatory process. According to Gross,<sup>3</sup> cicatricial tissue surrounding bronchi, bronchioles, and alveolar ducts will produce obstructive emphysema of a bullous type so that cavernous spaces will develop in the pulmonary parenchyma. In the early stage it is impossible to determine whether the cysts are of congenital origin with superimposed infection or whether the phenomenon is the product of pneumonitis or some other pulmonary condition. In the late stage, as pointed out by Gross,<sup>3</sup> the postinfectious origin of the cysts will become apparent only if a history of an acute infection is obtainable or the specimen is studied histologically. With cicatricial change of the bronchial mucous membrane there may be gradual obstruction and, distally, dilatation resulting in extension and thinning of the terminal bronchioles. Actually, the cyst may show the combined development of ruptured alveoli, forward development and spreading of a bronchus in which the columnar epithelium is preserved and carried forward into the cavity as an inner lining. It is possible in certain cases that an embryological defect is also a factor, combined with the mechanical influences of bronchial obstruction.

The possible mechanism of combined formation of the congenital and acquired types was suggested in a pathological specimen examined with Dr. E. Suhrawardy<sup>4</sup> at the Indian General Hospital near Asensol, India. Tracing the pathology of the wall, a curious thinning out of the columnar epithelium was noted, a part of the wall being composed entirely of fibrous tissue. It appeared that bronchial extension and dilatation had been extended coincidentally and that the wall of fibrosis was formed in a compensatory development thus completing a cyst-cavity.

According to Wood,<sup>5</sup> there is no syndrome on which a definite clinical diagnosis of congenital or acquired cysts may be based. Attacks of dyspnea with cyanosis, particularly in infancy and childhood, have aroused suspicion and the subsequent diagnosis. In older people progressive dyspnea with or without respiratory infection has been suggestive. Illustrating the difficulties in diagnosis is the fact that congenital cysts have been found in adults with no previous history of manifestations in childhood. Evidently, the severity of the symptoms is dependent upon (1) the extent of destruction of the parenchymal tissues and (2) changes in the intrathoracic pressure due to cysts with an imperfect bronchial communication. In the latter cases, the attacks of



severe dyspnea and cyanosis, may closely simulate spontaneous pneumothorax and with infection result in chronic empyema. Hemoptysis has been reported by Churchill<sup>6</sup> and others. Bouts of "pneumonitis" and "recurrent pneumonia" are suggestive since it is recognized that transient pulmonary phenomena can be due to blockage and extension of infection from the affected part.

The physical examination may show areas of increased hyperresonance and altered breath sounds and occasionally whispered pectoriloquy. Elevated temperature and expectoration suggest associated infection. Displacement of the heart and trachea to the contralateral side is not infrequent in large tension cysts. According to Willauer,<sup>7</sup> some cases closely resemble empyema due to infection *per se* and their failure to respond to treatment may be the first clue of the presence of a cyst.

Roentgenologically, the cystic spaces are well defined and are traversed by linear strands. When the cavities are "ballooned-out" by highly positive intraluminary pressure, the mediastinum and its contents are displaced to the opposite side. The translucency of the shadow may resemble that of tension pneumothorax. A feature of typical cases is the thin-walled cavity. While fluid levels are not uncommon, evacuation may be impossible and likewise the introduction of iodized oil into the cavities. With massive collections of fluid, the shadow may be dense and resemble consolidation. In certain instances the lung will show the mottled and increased density of pulmonary infection and the associated cystic areas.

Interest in the frequency of pulmonary cysts in adults, presumably of the acquired type, was aroused in studies of Indian workmen living in Bengal Province, India. The following cases are reported to illustrate the apparent influence of continued exposure to dampness, dust, and intercurrent respiratory infections and the effects of hard labor in the development or aggravation of acquired pulmonary cysts:

Attention was attracted to three men, primarily because they presented the appearance of far advanced pulmonary tuberculosis, with loss of weight, cough, expectoration, elevation of temperature, rapid pulse, and fatigue. It was customary for them to sleep on the ground, wear light clothes; exposure to wind, rain and dampness was common. As an example of the symptoms, one workman had a paroxysmal cough with dyspnea and glarey, mucoid sputum. The attacks were marked during the night and early morning hours, as the temperature lowered and dampness developed. His chest was hyperresonant over the middle third, with extremely distant breath sounds. In each case the x-ray films showed a large thin-walled cavity with mottled shadows

at the base of the lung; there was no evidence of pulmonary fibrosis or emphysema. Two other laborers working in a "surface well," suffered repeated attacks of coughing, dyspnea, and had glary expectoration. The symptoms were exaggerated as they climbed from the bottom of the excavation along a path approximately 100 feet in length with a grade of about 20 degrees. The physical examinations showed a decrease of respiratory movements on the affected side with exaggerated breath sounds and localized coarse, musical rales. In the roentgenograms of the chest there were signs of emphysema and single cavities, "balloon" in type, with remarkably thin walls. Repeated sputum tests were negative for tuberculosis. Bronchoscopy and iodized oil were not available for direct inspection or mapping of the bronchial tree.

Another patient was seen in a Government Hospital near Burdwan, India. The history indicated that there had been several attacks of pneumonia followed by cough, dyspnea, expectoration and empyema with drainage through the chest wall. The x-ray film showed an enormous, thin-walled cavity communicating with the sinus of the chest wall. The sputum and pus showed no tubercle bacilli or evidences of hydatid cyst. The presence of the cavity and the mucoid pus supported the diagnosis of cystic disease.

The following cases studied and treated in the Jefferson Hospital illustrate the clinical features and complications of cystic disease of the lungs:

Case 1: M. F., a married woman, 33 years of age, gave a history of shortness of breath since childhood and the occurrence of a spontaneous pneumothorax about four months before entry to the Hospital. The existence of some condition other than spontaneous pneumothorax was suspected by Dr. Peter Theodos because of the intermittent and slowly rising "intrapleural pressure." A thoroscopic examination by Dr. George Willauer showed a cystic wall and a partial obstruction of the bronchus which permitted air to enter and be trapped in the cyst, thus simulating pneumothorax. Lobectomy was performed and the specimen showed the features of acquired cyst of the lung.

Case 2: E. L., male, age 14, was referred for the treatment of loculated empyema with long continued attacks of violent coughing and fever. The x-rays showed small cavities and fluid at various levels of the lung. The bronchoscopic examination was essentially normal. In the specimen of the lung removed by lobectomy, there were the typical features of acquired cyst of the lung.

Case 3: E. M., a married woman, 51 years of age, had experienced for 12 years curious manifestations in the right side of her chest, sometimes associated with cough and "gurgling" especially on changing positions. Tuberculosis had been suspected. A large thin-walled cavity was seen in the x-ray studies (Dr. Paul Swenson). Bronchoscopy showed no abnormality of the bronchi. A large cyst of the lung was removed by lobectomy. The histological studies showed the features of acquired cystic disease due to extension and dilatation of the bronchi.

## CONCLUSIONS

1) It is suggested that cystic disease of the lung should be considered in patients with nontuberculous pulmonary cavities and bizarre pulmonary symptoms.

2) Recurrent attacks of persistent hard cough, glarey expectoration and dyspnea should arouse suspicion.

3) The complications of pulmonary cysts are varied and may completely mask the underlying condition.

4) Etiology may be indefinite; the occurrence of repeated respiratory infections associated with the trauma of cough and strenuous effort may be contributing factors.

5) Cases observed in India unproved as to the type of cyst, are included in the present report to indicate the possible influences of exposure, pulmonary infection and work in the development of cysts.

## CONCLUSIONES

1) Se sugiere que se considere la enfermedad quística del pulmón en pacientes con cavernas pulmonares no tuberculosas que presentan síntomas pulmonares poco comunes.

2) Accesos periódicos de tos fuerte y persistente, expectoración viscosa y disnea, deben despertar sospechas.

3) Son variadas las complicaciones de los quistes pulmonares y pueden encubrir por completo la condición subyacente.

4) La etiología puede ser vaga; repetidas infecciones respiratorias asociadas con el traumatismo de la tos y de esfuerzos estrenuos, pueden ser factores contribuyentes.

5) En el presente informe se incluyen casos observados en India de quistes de tipo indeterminado, para indicar las posibles influencias de la exposición, la infección pulmonar y el trabajo en el desarrollo de los quistes.

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## Early Clinical Features of Bronchogenic Carcinoma: Illustrative Cases\*

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Only three or four decades ago, the number of cases of bronchogenic carcinoma in which the diagnosis was established or even suspected during life was extremely small. As adequate facilities for diagnosis have become more available, the proportion of cases proven in all stages of the disease has shown a progressive increase. For example, a recent analysis of 310 cases of bronchogenic carcinoma seen at the Chevalier Jackson Bronchoscopic Clinic,<sup>1</sup> showed that histologic proof of the diagnosis was obtained during life, bronchoscopically or otherwise, in about 97 per cent of cases. During the same period there were observed an additional 37 cases in which the clinical diagnosis of bronchogenic carcinoma appeared highly probable, although conclusively diagnostic tissue was not obtained.

Statistics with regard to operability, however, leave much to be desired. Of a series of 269 proven cases seen at the Chevalier Jackson Bronchoscopic Clinic from January 1935 to December 1944 inclusive, only 30 (12.9 per cent) were found operable. The fact that the majority of bronchogenic carcinomas have reached an inoperable stage before the diagnosis is established is corroborated by the experience of most thoracic surgeons.

A survey of the case-records in the above-mentioned series indicates that many of the delays in diagnosis could have been avoided if the indications for roentgen examination, bronchoscopy and other diagnostic procedures had been properly appreciated. The early manifestations of a bronchogenic carcinoma may easily be confused with those of a variety of other common chest diseases, and for this reason a consideration of early clinical features seems appropriate.

The early manifestations of a bronchial carcinoma depend to a large extent on its point of origin, so that an arbitrary classification based on location is of more practical value for clinical

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study than one based on the inherent pathological characteristics of the tumor itself. Thus separate consideration might be given those tumors which arise in a main or lobar bronchus, those which arise in a segmental bronchus, and those which arise peripherally (Fig. 1). It is believed that somewhat more than 50 per cent of the carcinomas arise in a main, stem or lobar bronchus; a much smaller number appear to have originated in one of the segmental bronchi, and about 25 per cent of the lesions are thought to arise peripherally.

**Carcinoma of the Larger Bronchi (Numbers 1 and 2 in Fig. 1):** The earliest symptom of a lesion arising in one of the larger bronchi is one of bronchial irritation, namely, a chronic cough, usually nonproductive. If there has been a pre-existing cough, some change in its character or frequency may be noted. After a variable interval, other symptoms arise because of an increasing degree of bronchial obstruction which interferes with air exchange



FIGURE 1: Bronchogenic Carcinoma; Arbitrary Classification Based on Location. The early clinical manifestations, including roentgen findings, depend on the point of origin: Main bronchus (1), lobar bronchus (2), segmental bronchus (3), or small peripheral bronchus (4).



FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 2: Negative roentgenogram of a 52 year old male in whom an early carcinoma of the left bronchus (squamous cell) was found on bronchoscopy.—FIGURE 3: Male, 47 years old, with symptoms and roentgen findings suggestive of bronchiectasis; carcinoma of the right main bronchus (squamous cell) proven by bronchoscopic biopsy.—FIGURE 4: Male, 58 years old, under treatment for "asthma." Bronchoscopy showed early carcinoma of right main bronchus.

or bronchial drainage or both. The lesser degrees of bronchial obstruction may give rise to a wheeze, which can often be localized by the patient to one side or the other, and is more or less continuous until the obstruction becomes nearly complete.

Impairment of the normal mechanisms of bronchial drainage results in secondary infection, which may at first resemble one of the common acute lower respiratory infections, so that patients at this stage of the disease are often treated for various types of pneumonia, bronchitis, "flu," "grippe," common cold, pleurisy and the like. Often such acute episodes appear to subside under medical treatment, but there remains a persistent cough, often productive of purulent sputum. Blood streaking or hemoptysis is prone to occur during the early phase of the disease in cases where the lesion is in one of the larger bronchi.

An incipient carcinoma in a main or lobar bronchus gives rise to no abnormal physical findings. As is now generally recognized, abnormal physical signs as well as roentgen findings, when they first appear, are likely to be those of some degree of bronchial obstruction, the presence of tumor being suspected only because of its effect on air exchange and bronchial drainage. Accordingly, the physical examination may show, as the first manifestation, nothing more than diminished respiratory excursion of the corresponding hemithorax; Thomas McCrae,<sup>2</sup> felt that this was the most constant physical finding in early cases. Associated with this may be some diminution in breath and voice sounds; transient or persistent moist rales may be heard.

As appreciable degrees of bronchial obstruction develop, the asthmatoïd wheeze described by Chevalier Jackson,<sup>3</sup> best heard at the open mouth near the end of a forcible expiration, may be heard, and auscultation may show a unilateral wheeze. Further increase in the degree of bronchial obstruction is accompanied by an interval when the check-valve mechanism gives rise to signs of obstructive emphysema. This period is a transitory one; the obstruction in cases of malignant tumor soon become complete, so that the signs of emphysema are soon succeeded by those of atelectasis. Physical signs which change from day to day characterize the period of increasing bronchial obstruction.

As would be expected, an incipient lesion in a main or lobar bronchus may give rise to no positive roentgen findings. This point is illustrated by the following case.

Case I: G. A., male, 52 years, a physician, had noted a chronic cough, productive of small amounts of mucoid sputum, for about 5 months. Blood-streaking had been noted on several occasions although there had been no actual hemoptysis. The physical examination showed no abnormal chest findings. The roentgen examination of the chest, including

fluoroscopy, was considered entirely negative (Fig. II). However, the bronchoscopy showed a nodular area along the wall of the left main bronchus which proved, on biopsy, to be a squamous cell carcinoma.

Although in the series of 310 cases recently reviewed there were only 6 cases in which the chest films were thought to be essentially negative, this number might have been much larger if there had been less delay between the onset of symptoms and the first x-ray examination. This case illustrates the fact that symptoms alone may be sufficient indication for bronchoscopy, even though the x-ray film may show little or no abnormality. Unfortunately, the number of cases in which bronchoscopy is made available at this early stage is distressingly small, for there is a general tendency to defer such an examination if the x-ray shows little or no abnormality. There is but little physical disability at this stage of the disease, so that it is not unusual for both the patient and his physician to minimize the importance of the symptoms. However, the very lesions which show no early roentgen changes are those which arise in the larger bronchi, and are therefore accessible bronchoscopically almost in their incipiency.

Case II: J.D., male, 47 years, complained of productive cough of 9 months duration following what had appeared to be an atypical pneumonia; the sputum had been blood-streaked at times. Auscultation showed numerous coarse moist rales at the right base, and the x-ray (Fig. III) demonstrated in the right lower lobe region, abnormal stringy density of the type often associated with bronchiectasis. However, the bronchoscopy showed a carcinoma of the right bronchus, inoperable because of its proximity to the carina.

In this case, there had been a clinical diagnosis of bronchiectasis, and the referring physician was inclined to feel that the rather mild symptoms, apparently adequately explained by the roentgen findings, would scarcely call for a diagnostic bronchoscopy. The above case well illustrates the fact that persistence of chest symptoms following what has seemed to be one of the common acute lower respiratory infections should call for further investigation, certainly by roentgen examination and frequently by bronchoscopy.

Case III: G.L., male, 58 years, had been treated by his family physician for asthma and hay fever for over 15 years. Recently, however, the wheezing had been more or less continuous, with paroxysmal exacerbations only partially relieved by the usual medications; there had been increasing dyspnea, with increased cough and one episode of blood-streaking. The x-ray (Fig. IV) showed fibrosis and emphysema, with abnormal mottled and stringy density in the right lower lung field, adjacent to the heart border. These changes were thought to be compatible with a history of long-standing bronchial asthma, but the bronchoscopy showed that there was in addition, a relatively early carcinoma of the right main bronchus.



The above case undoubtedly was, for many years, one of "bronchial asthma," for there was a long history of paroxysmal attacks relieved by administration of adrenalin; however, the occurrence of a wheeze which was more or less continuous indicated that there might be a partially obstructive lesion in one of the larger bronchi. Even in cases where the clinical findings suggest bronchial asthma of the common type, a diagnostic bronchoscopy may frequently prove to be worthwhile, apart from the finding of previously unsuspected lesions.

Case IV: V. R., male, 46 years, had noted a chronic cough, productive of small amounts of purulent sputum, for about 6 months. The roentgen examination (Fig. V), showed some abnormal density which, by its character and distribution, rather suggested the possibility of bronchiectasis, and the patient had been referred with a clinical diagnosis of bronchiectasis with a request for bronchography. However, it was decided that a bronchoscopy should be done first, as is the custom, and the right lower lobe bronchus was found to be narrowed by a nodular lesion which proved on biopsy to be a squamous cell carcinoma of rather low grade. There were no evidences of inoperability, a pneumonectomy was performed, and the patient, now about thirty months after operation, has no symptoms or findings suggestive of recurrence or metastasis.

It is important in cases of this sort not to be satisfied with bronchography alone. An early lesion in one of the larger bronchi may, if only partially obstructive, not interfere with complete filling of the bronchial tree. Although Farinas<sup>4</sup> has felt that bronchography has considerable importance in the diagnosis of tumors of the larger bronchi, and has even devised a classifica-

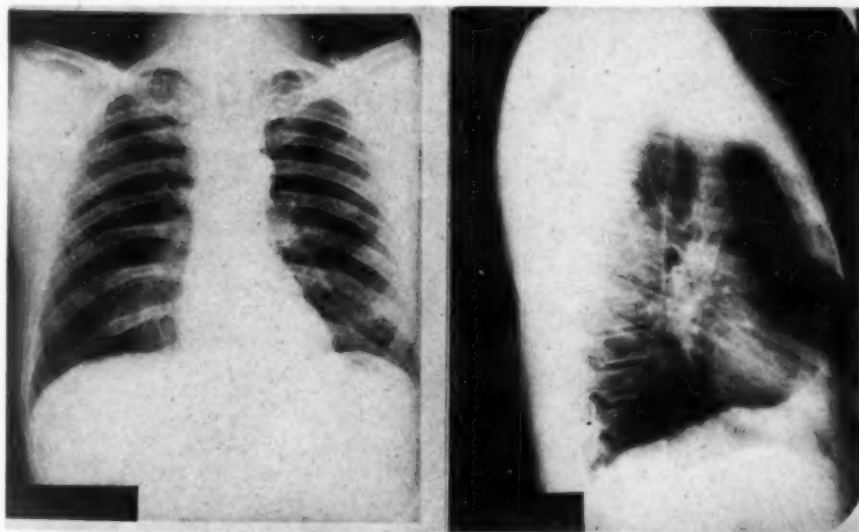


FIGURE 5: Male, 46 years old, referred for bronchography with clinical diagnosis of bronchiectasis. Early squamous cell carcinoma of right lower lobe bronchus proven by bronchoscopic biopsy. Pneumonectomy.

tion based on the bronchographic appearance, dependence cannot be placed on this procedure in ruling out an early neoplasm of one of the larger bronchi; frequently the walls of this portion of the bronchial tree are not completely coated with lipiodol, in spite of a technic which is otherwise satisfactory.

Case V: M. K., male, 48 years, complained of chronic cough, productive of purulent sputum, at times quite foul; these symptoms had appeared to follow a "pneumonia" 6 months previously. In the interval there had been intermittent fever, sweats, and considerable weight loss; the patient was referred with a clinical diagnosis of "suppurative pneumonitis." The x-ray findings are shown in Fig. VI. In this case, as in many others which have been treated under a diagnosis of "unresolved pneumonia," the underlying cause was a partially obstructive bronchial lesion. The carcinoma in this instance was in the right lower lobe bronchus.

Cases II, III, IV and V illustrate the fact that changes which may appear to be on a basis of chronic non-specific inflammatory disease may simply represent impairment of bronchial drainage due to an early phase of bronchial obstruction. In none of these cases was the tumor itself evident on the conventional films, and in none of them had sufficient obstruction occurred to produce interference with air exchange (i.e. obstructive emphysema or atelectasis). In such cases an important diagnostic point is that the roentgen changes are lobar or unilateral; such findings nearly always call for a diagnostic bronchoscopy.

Case VI: A. A., female, 38 years, complained of cough, productive of small amounts of mucoid sputum, of 2½ years duration, with continuous wheezing for the previous several months. Several rather large hemoptyses had occurred recently. The physical examination showed hyper-

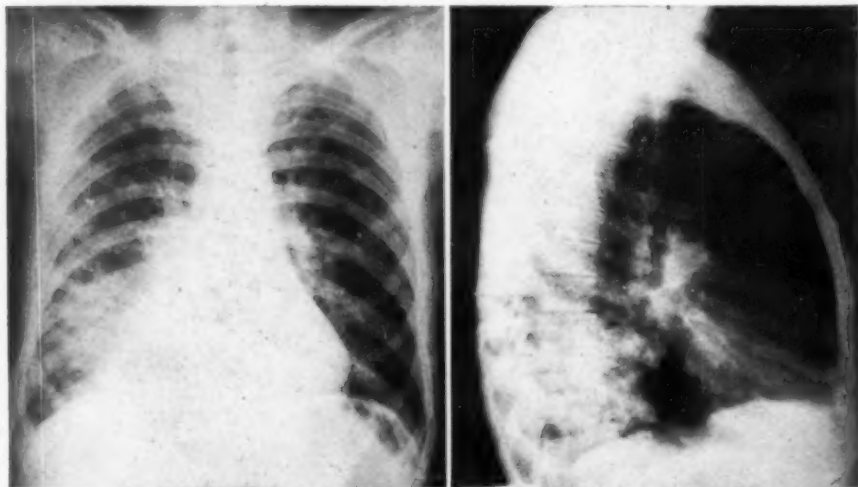


FIGURE 6: Male, 48 years old. "Suppurative pneumonitis" secondary to squamous cell carcinoma of right lower lobe bronchus.

resonance and diminished breath sounds throughout the entire left chest and the roentgen examination (Fig. VII), showed a characteristic picture of obstructive emphysema of the entire left lung. On bronchoscopy, a nodular lesion almost completely occluding the left bronchus was found and biopsy showed adenocarcinoma, grade II.

The phenomenon of obstructive emphysema is observed most dramatically on fluoroscopy, where, if the obstructive lesion is in a main bronchus, the emphysematous lung contrasts strikingly with the normally emptying lung on expiration. In this case, the left lung appeared hyperaerated even at the height of in-

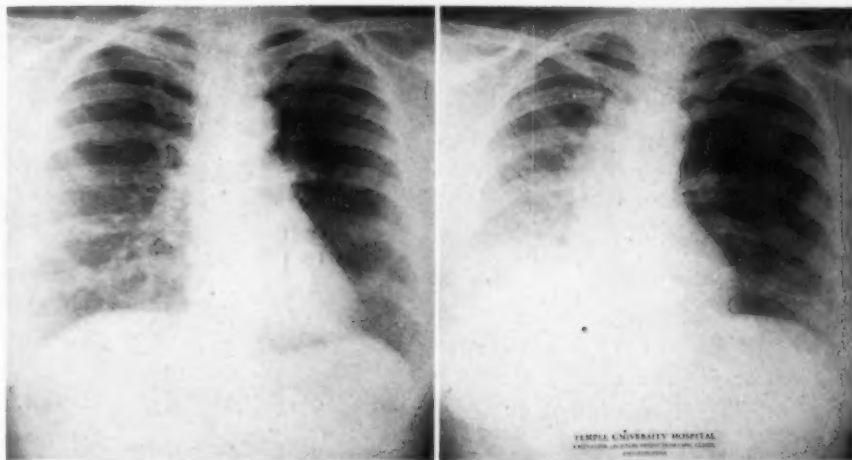


FIGURE 7: Female, 38 years old. Obstructive emphysema of left lung due to adenocarcinoma of left main bronchus.

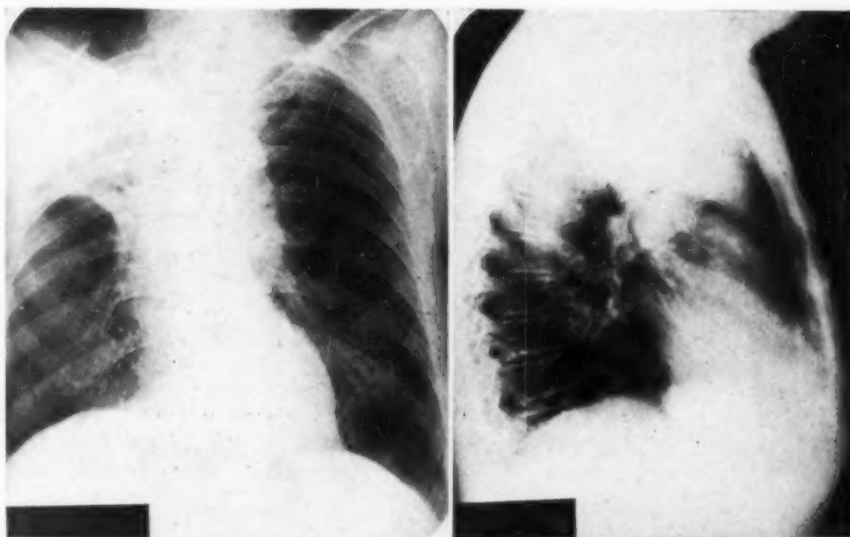


FIGURE 8: Male, 67 years old. Atelectasis of right upper lobe; squamous cell carcinoma of right upper lobe bronchus, proven by bronchoscopic biopsy.

spiration (Fig. VIIa). On expiration (Fig. VIIb), the right lung emptied normally, the left lung remained distended and the left leaf of the diaphragm remained depressed, the mediastinum swinging far to the right.

Case VII: C. C., male, 67 years, a physician, presented a history of non-productive cough of many years duration. Recently the cough had increased in frequency and hemoptysis had been noted for approximately 3 months. The roentgen examination (Fig. VIII) showed a complete atelectasis of the right upper lobe, with numerous radiolucent areas suggesting parenchymal destruction. Tissue obtained just within the right upper lobe orifice at the time of bronchoscopy showed squamous cell carcinoma, grade III.

Cases VI and VII illustrate two of the more commonly recognized roentgen evidences of an obstructive bronchial lesion; in cases of this sort the indications for bronchoscopy are quite obvious and, since the lesions giving rise to emphysema or atelectasis of a lobe or an entire lung are in the larger bronchi, biopsy is feasible in a high proportion of cases, even when the lesion originated in an upper lobe bronchus.

The impression is occasionally encountered that bronchoscopy will be of less value in upper lobe lesions. Table I presents data regarding the incidence of positive bronchoscopic biopsy in relation to probable origin. This series of patients seen at the Chevalier Jackson Bronchoscopic Clinic included all those in whom the diagnosis of bronchogenic carcinoma was ultimately proven,

TABLE I  
BRONCHOGENIC CARCINOMA — 310 PROVEN CASES  
Incidence of Positive Bronchoscopic Biopsy in Relation  
to Probable Origin

	CASES	POSITIVE BIOPSY	
		No.	Per cent
Right upper lobe	63	37	58.7
Right middle lobe	7	4	57.0
Right lower lobe	70	62	88.6
Right main or stem bronchus	36	36	100.0
Right lung — origin uncertain	13	3	23.1
Left upper lobe	40	13	32.6
Left lower lobe	44	38	86.4
Left main bronchus	25	25	100.0
Left lung — origin uncertain	9	1	11.1
Bilateral — side of origin uncertain	2	0	0.0



regardless of the method by which the diagnosis was finally established. The incidence of positive bronchoscopic biopsy is somewhat less in the upper lobe lesions, particularly those in the left upper lobe, but there is sufficient indication for bronchoscopy in many upper lobe cases, particularly those in which the x-ray films suggest that the tumor is near the hilus, or give evidence of obstruction of the lobar bronchus. Furthermore, as C. L. Jackson<sup>5</sup> has emphasized on many occasions, bronchoscopy should be done not only with the expectancy of obtaining tissue for biopsy, but to rule out involvement of the main bronchus in its proximal portion and to evaluate any indirect evidence of mediastinal involvement such as compression or fixation of the lower trachea or main bronchus, or widening or fixation of the carina.

Not all of the tumors which are thought to arise in the larger bronchi give rise to early signs of obstruction. The stage of the disease at which the phenomena of obstructive emphysema or atelectasis occur will depend not only on the size of the bronchus involved, but also on the ratio between the endobronchial and extrabronchial portions of the tumor. Thus, in some of the so-called "hilar" lesions, such as that shown in Fig. IX, the infiltrating extrabronchial portion apparently has progressed much more rapidly than the endobronchial portion. In most of these cases, infiltration of the mediastinum has already occurred before the diagnosis is established, because the patient is apparently not ill enough to require special studies or even roentgen examination prior to the occurrence of those manifestations depending on obstruction. In the case illustrated in Fig. IX, the compression

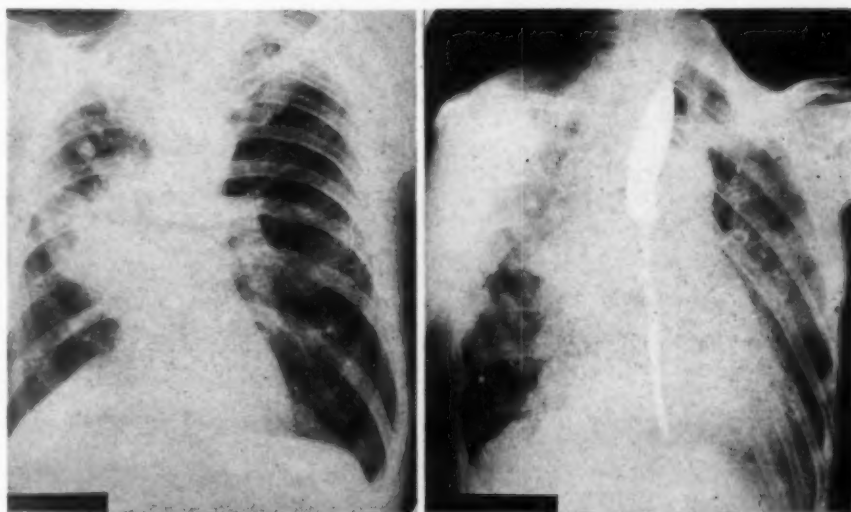


FIGURE 9: "Hilar" bronchogenic carcinoma (squamous cell) with mediastinal invasion.

and displacement of the esophagus and the presence of phrenic nerve paralysis (paradoxical motion of the diaphragm as seen fluoroscopically) indicated an inoperable situation.

The patient whose roentgen films are represented in Fig. X illustrates another of the rather common manifestations of bronchial obstruction, namely pulmonary abscess. The frequency with which this type of pulmonary suppuration is associated with a bronchial lesion is such that diagnostic bronchoscopy appears indicated in any case where cavitation is not clearly tuberculous in origin, a point which has been thoroughly discussed by C. L. Jackson.<sup>6</sup> A relatively early tumor may be responsible for extensive secondary changes such as those shown in Fig. X; in this case, the carcinoma of the right lower lobe bronchus was quite small, and the part of the lung in which the large abscess had occurred showed no evidence of tumor infiltration.

**Carcinoma Arising in a Segmental Bronchus (No. 3 in Fig. I):** The cases which may be included under this heading constitute an important, though not a large group. Here the diagnosis can be made early, though with somewhat greater difficulty than in cases where larger bronchi are involved, and the incidence of operability is rather high. A lesion arising here will obstruct the segmental bronchus almost at the start; for this reason the symptoms frequently have their onset in a more or less acute febrile illness consequent on segmental obstruction and secondary infection. Although the physical signs may not be striking, an x-ray film made at this time will show changes limited to a single bronchopulmonary segment; there will be a wedge-shaped area

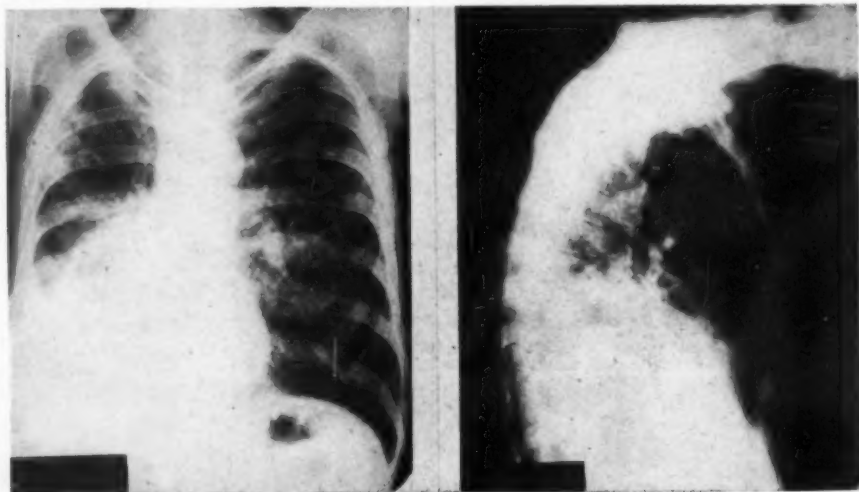


FIGURE 10: Large pulmonary abscess secondary to carcinoma of right lower lobe bronchus.

of density extending peripherally from the hilus, and the involved segment can usually be identified in the lateral view.

Case VIII: J. B., male, 50 years, gave a history of persistent symptoms (cough, purulent expectoration and low-grade fever) following what had appeared to be a pneumonia, and the x-ray films (Fig. XI, a and b) made on his admission to the hospital showed changes which appear limited to the posterior basal segment of the right lower lobe. The first bronchoscopy in this case showed nothing except for purulent secretion and mucosal congestion. The iodized oil instilled for bronchography, however, showed occlusion of the bronchus of the posterior basal segment a short distance from its point of origin (Fig. XI c). This is just beyond the range of visibility in the ordinary bronchoscopic examination, but another bronchoscopy was done, and by use of a small forceps introduced into the posterior basal segmental bronchus, which can be quite easily identified, tissue was obtained which showed squamous cell carcinoma, grade II. This proved to be an operable case and now, after about 3½ years, there is no evidence of recurrence or metastasis.

Roentgen evidence of a segmental atelectasis is as strongly suggestive of bronchial occlusion as is a lobar atelectasis; if this fact is recognized and if every effort is made to obtain material for histologic diagnosis, many of these lesions can be proven while still operable. The relative constancy of the segmental bronchial anatomy, a subject recently reviewed by Jackson,<sup>7</sup> facilitates a correlation of roentgen findings with the bronchoscopic approach in such cases; careful study of the postero-anterior and lateral roentgenograms before and after instillation of iodized oil will frequently show which of the segmental bronchi deserve particular attention at the time of bronchoscopy. In cases where actual tissue cannot be obtained from a segmental bronchus, examination of secretions obtained from the segmental bronchus, according to the technic of Herbut and Clerf,<sup>8</sup> would seem to be a particularly advantageous method.

A number of British authors, Barrett,<sup>9</sup> Dudgeon,<sup>10</sup> Gowar<sup>11</sup> and others have reported a high percentage of accuracy in cases diagnosed by examination of sputum for malignant cells. Benice<sup>12</sup> has described the use of bronchial lavage in obtaining material for microscopic examination, and Perez-Ara<sup>13</sup> has described the use of a special "broncho-catheter" introduced under fluoroscopic guidance in obtaining material from segmental bronchi.

The following two cases illustrate the difficulties of differential diagnosis in instances where the lesion arises in a segmental bronchus.

Case IX: R. S., male, 27 years, complained of slightly productive cough of several weeks duration, with blood-streaking on two occasions. Tuberculosis was considered the most likely possibility in view of the age and roentgen findings (Fig. XII). The bronchoscopy was negative and pneu-

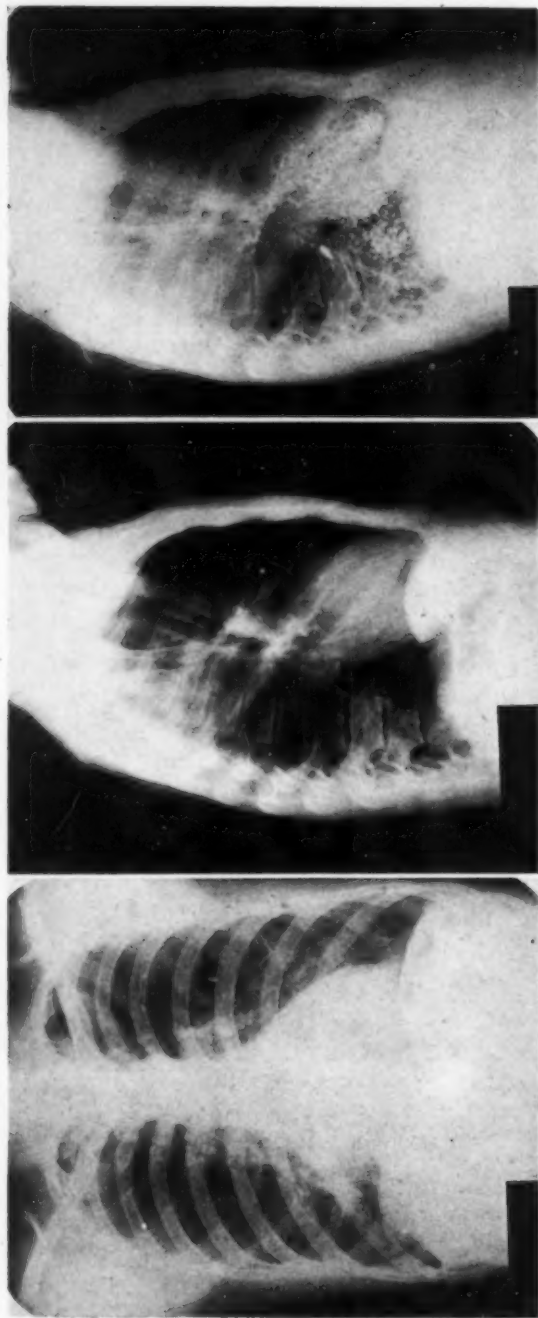


FIGURE 11: Male, 50 years old. Atelectasis of posterior basal segment of the right lower lobe. Biopsy obtained bronchoscopically from posterior basal segmental bronchus showed squamous cell carcinoma. Pneumonectomy.



mothorax was given, although sputa had been consistently negative. This proved to be a case of undifferentiated carcinoma, presumably arising in the segmental bronchus, ultimately proven after an interval of six months by microscopic examination of particles of tissue found in the sputum.

Case X: J. C., male, 42 years, complained of chronic cough, usually nonproductive, with one recent hemoptysis. Serial roentgen examinations (Fig. XIII) showed the development of an atelectatic segment in the right upper lobe. Pneumothorax had been given previously on a



FIGURE 12: Male, 27 years old. Symptoms and roentgen findings suggestive of pulmonary tuberculosis. Undifferentiated carcinoma arising in segmental bronchus in left upper lobe.

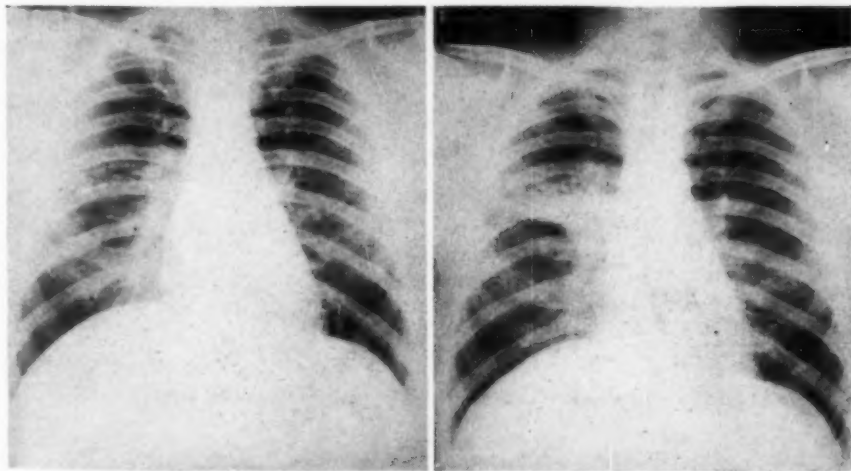


FIGURE 13: Male, 42 years old, who had been in a sanatorium for tuberculosis for several months. Squamous cell carcinoma arising in segmental bronchus in right upper lobe.

presumptive diagnosis of tuberculosis without confirmation by positive sputum. This patient was referred for bronchoscopy eleven months after the onset of symptoms, and a carcinoma was found extending to within a few millimeters of the right upper lobe bronchial orifice. A pneumonectomy was done, but recurrence was found in the bronchial stump after 10½ months. Here the delay of many months between the onset of symptoms and the proving of the diagnosis may well have been responsible for the fact that this patient could not be cured.

**Carcinoma Arising from Peripheral Bronchi (No. 4 in Fig. 1):**  
The bronchogenic carcinomas which arise peripherally might quite appropriately be called "silent tumors," for they frequently attain

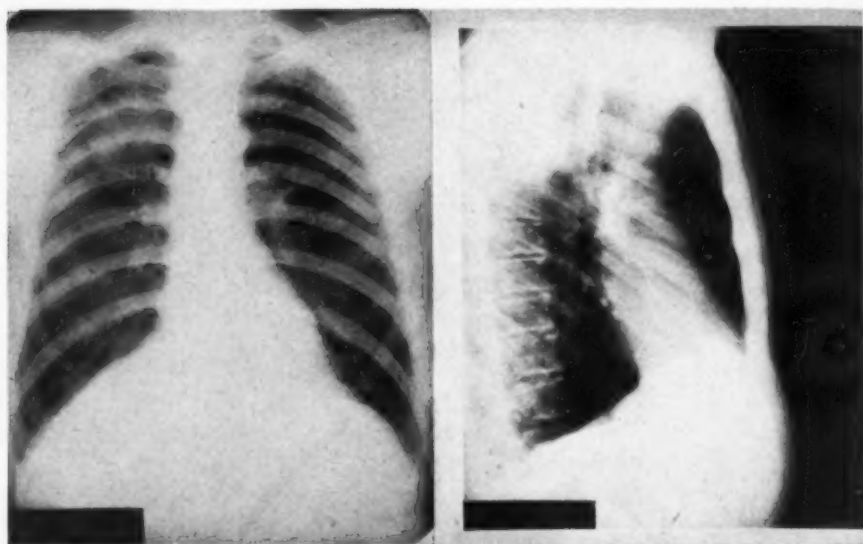


FIGURE 14: Male, 54 years old, without pulmonary symptoms. Lesion discovered fluoroscopically during roentgen examination of gastro-intestinal tract. Carcinoma proven by aspiration biopsy. Pneumonectomy.

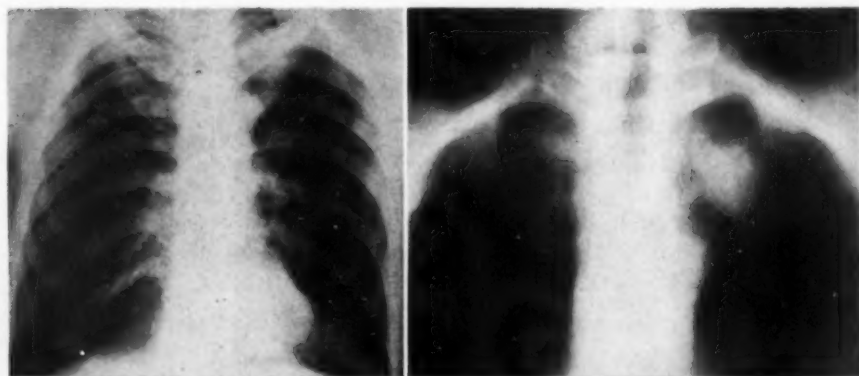


FIGURE 15: Male, 52 years old, complaining of hoarseness (left recurrent) paralysis) but without pulmonary symptoms. Carcinoma proven by aspiration biopsy.

a considerable size without giving rise to pulmonary symptoms. Phenomena relating to bronchial obstruction usually do not occur, so that appreciable amounts of atelectasis and secondary infection are not encountered, although there may be cavitation within the tumor itself. The presenting symptoms in cases of this group are often extrapulmonary; metastases are thought to occur rather early, and symptoms attributed to metastasis to the brain, bones or other parts of the body may precede those of the primary lesion.

Peripheral tumors are at times encountered unexpectedly by fluoroscopic examination incidental to roentgen examination of some other part of the body. Figure XIV illustrates the case of a 54 year old male whose gastro-intestinal tract was being examined because of symptoms suggesting peptic ulcer. Although there were no pulmonary symptoms, this lesion was quite evident on fluoroscopy, and tissue obtained by needle aspiration biopsy under fluoroscopic guidance showed carcinoma.

The patient whose films are represented in Figure XV complained primarily of hoarseness and had no chest symptoms. The hoarseness was found to be due to a left recurrent paralysis of the larynx and the peripheral tumor was shown in the x-ray films made as a part of the routine in search for the cause of the recurrent paralysis. The tumor is well shown on the planigram, which suggests that there is infiltration toward the mediastinum in the region of the aortic arch, thus accounting for the recurrent paralysis. The diagnosis in this case too was established by needle biopsy under biplane fluoroscopic guidance.

The peripheral tumors, which constitute about 25 per cent of all bronchogenic carcinomas, are generally not accessible to bronchoscopic biopsy. However, the method of aspiration biopsy, best performed under guidance of the biplane fluoroscope,<sup>14</sup> has been used with success in a rather high percentage of cases where the simpler methods of obtaining tissue are not feasible. In a group of 69 cases in which an attempt was made to obtain material by aspiration biopsy, positive evidence of malignancy was obtained in 45 or 66 per cent; the specimen was conclusive as to cell type (i.e. squamous cell, adenocarcinoma, etc.) in 54.4 per cent of the cases thus proven. As indicated in Table II, 14.5 per cent of the cases seen at the Chevalier Jackson Bronchoscopic Clinic have been proven by aspiration biopsy.

There is not, however, general agreement as to the wisdom of using aspiration biopsy in diagnosis of lung tumors. Craver,<sup>15</sup> in reporting the considerable experience of the Memorial Hospital, finds the procedure a perfectly safe one; he has not observed growth of tumor along the needle tract, nor had he seen evidence of disseminated infection, even when the biopsy was performed

in the presence of suppuration. Transitory symptoms attributed to air embolism were observed in two of his cases.

Dolley and Jones<sup>16</sup> have mentioned a case in which implantation of tumor along the needle tract apparently occurred, although this was a case in which there was pleural involvement, with pleural fluid presumably containing malignant cells. A number of the thoracic surgeons, including Overholt,<sup>17</sup> Adams,<sup>18</sup> Ochsner<sup>19</sup> and others are frankly opposed to aspiration biopsy in any case which is potentially suitable for surgery. This stand is based chiefly on the grounds that exploration will be indicated whether or not a positive biopsy is obtained, since a negative aspiration is not generally regarded as completely ruling out the possibility of tumor. These authors feel that it is unwise to subject the patient to additional risks of dissemination or other complication, and prefer to confirm the diagnosis at the time of operation.

As stated above, resection was found possible in only 12.9 per cent of a series of 269 consecutive proven cases of carcinoma of the bronchus seen at the Chevalier Jackson Bronchoscopic Clinic. This series of course included patients in all stages of the disease. The rather low incidence of operability in bronchogenic carcinoma may be attributed directly to the fact that, although facilities for the examinations required to establish an early diagnosis (x-ray, bronchoscopy and the others) are now almost universally accessible, they are often not made available to the patient for many months following the onset of symptoms.

In the patients of Overholt's<sup>20</sup> series, for example, symptoms

TABLE II  
BRONCHOGENIC CARCINOMA — 310 CASES  
Method of Obtaining Histologic Diagnosis

Histologic Diagnosis Obtained During Life	302 (97 per cent)	No.	Per cent
Bronchoscopic Biopsy		221	71.3
Pleural Fluid Cytology		12	3.9
Lymph Node Biopsy		12	3.9
Aspiration Biopsy		45	14.5
Sputum Examination		2	0.6
Thoracoscopic Biopsy		1	0.3
Open Biopsy of Pleura		2	0.6
Exploratory Operation		7	2.3
Histologic Diagnosis Obtained only at Autopsy	8 (2.7 per cent)		



had been present for an average of about 3 months before medical advice was sought. An average additional interval of 3 months had elapsed before the first x-ray examination, and yet another six months had passed before the diagnosis was established. Most cases of carcinoma of the bronchus undoubtedly pass from an operable to an inoperable stage within a few months. In the early stages, there is usually little disability, yet this is the stage in which diagnoses must be made if the present statistics are to be improved. The expanding application of group surveys by the various roentgen methods offers much hope for the earlier discovery of all varieties of chest lesions; for the present, however, progress in the early diagnosis of bronchogenic carcinoma must depend on a general awareness of its frequency, and recognition of the need for adequate study by present-day methods when chest symptoms are unexplained.

#### SUMMARY AND CONCLUSIONS

1) Cases illustrating the various early clinical and roentgenologic manifestations of bronchogenic carcinoma have been presented.

2) The early manifestations of a bronchogenic carcinoma depend chiefly on its point of origin, so that an arbitrary classification based on location offers a logical basis for understanding the mechanism by which the early symptoms, signs and roentgen abnormalities are produced.

3) To avoid confusion with the other common lower respiratory diseases, thorough clinical study appears advisable in the following groups of cases: (a) Those in which chronic pulmonary symptoms (notably cough, blood-streaking or hemoptysis, wheezing) are not adequately explained, (b) Those in which symptoms or abnormal physical findings persist after what has appeared to be one of the common acute lower respiratory infections, (c) Those in which the roentgen examination shows evidence of impaired bronchial drainage (abnormal density of unilateral, lobar or segmental distribution, unless obviously tuberculous in origin with positive sputum) or impaired aeration (obstructive emphysema, atelectasis of a lung, a lobe or a bronchopulmonary segment). In cases where a tumor-like lesion is evident on the roentgenogram, the need for complete study is apparent. The finding of cavitation not clearly tuberculous in origin should of course call for further investigation.

4) Complete study should include, in addition to the roentgen examination, a bronchoscopy, with bacteriologic study of bronchial secretions; cytologic examination is indicated in those cases in which tissue for biopsy is not obtainable at bronchoscopy. In cases where the differential diagnosis includes tuberculosis, examination

of sputa or gastric washings and skin-testing are in order. Additional procedures which may be indicated in a given case include bronchography, planigraphic study, bacteriologic and cytologic examination of pleural fluid, aspiration biopsy and occasionally thoracoscopy.

5) Exploratory operation is indicated in cases where there is convincing clinical evidence of bronchogenic carcinoma, even though a proven histologic diagnosis is not obtainable, provided there is no evidence of extrapulmonary invasion or metastasis, and provided the operative risk is not disproportionate.

### RESUMEN Y CONCLUSIONES

1) Se han presentado casos ilustrativos de las varias manifestaciones clínicas y roentgenológicas tempranas del carcinoma broncogénico.

2) Las manifestaciones tempranas del carcinoma broncogénico dependen principalmente de su lugar de origen, así es que una clasificación arbitraria basada en su ubicación ofrece una base lógica para entender el mecanismo que produce los síntomas, signos y anomalías roentgenológicas tempranas.

3) Para evitar confusión con las otras enfermedades comunes del aparato respiratorio inferior, parece ser prudente que se lleve a cabo un estudio clínico completo en los grupos de casos siguientes: (a) Aquellos en los que no se puede explicar adecuadamente la presencia de síntomas pulmonares crónicos (especialmente tos, esputo veteado de sangre o hemoptisis y resuello difícil y ronco); (b) Aquellos en los que persisten síntomas y hallazgos físicos anormales después de lo que pareció haber sido una de las infecciones agudas comunes del aparato respiratorio inferior; (c) Aquellos en los que el examen roentgenológico revela signos de canalización bronquial inadecuada (sombras anormales de distribución unilateral, lobular o segmentaria, a menos de que sean de indudable origen tuberculoso con esputo positivo) o de aeración defectuosa (enfisema obstructivo, atelectasia de un pulmón, un lóbulo o un segmento broncopulmonar). En casos en los que una lesión que parece tumor se evidencia en la radiografía, es aparente la necesidad de un estudio completo. El hallazgo de cavernas que no sean claramente de origen tuberculoso exige, por supuesto, una investigación adicional.

4) El estudio completo debe incluir, además del examen roentgenológico, una broncoscopia, con estudio bacteriológico de las secreciones bronquiales; se indican exámenes citológicos en esos casos en los que no es posible obtener tejido para biopsia durante la broncoscopia. En casos en los cuales el diagnóstico diferencial incluye la tuberculosis se deben verificar exámenes del esputo y

del lavado gástrico y pruebas cutáneas. Otros procedimientos que pueden estar indicados en algunos casos incluyen broncografía, estudios planigráficos, exámenes bacteriológicos y citológicos de derrames pleurales, biopsia por aspiración y, ocasionalmente, toracoscopia.

5) Se indica una operación exploratoria en casos en los que hay pruebas clínicas convincentes de carcinoma broncogénico, aun cuando no sea posible comprobar el diagnóstico histológico, con tal de que no haya signos de invasión extrapulmonar o de metástasis, y con tal de que el riesgo operatorio no sea excesivo.

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## Pulmonary Abscess Secondary to Bland Pulmonary Infarction\*

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Much has been written on the subject of pulmonary infarction and its signs and symptoms, but little has been written concerning its course, possible complications and end results. In particular, references to pulmonary abscess secondary to bland infarction have been noted relatively infrequently. The purpose of this study was to determine the incidence of such abscesses, their clinical course and, if possible, something of their pathogenesis.

Specific cases of pulmonary abscess occurring after pulmonary infarction are few, although a number of writers had much to say on the subject. Welch<sup>1</sup> early recognized the possibility when he stated that "even when caused by bland pulmonary emboli, pulmonary infarcts are exposed to the invasion of bacteria from the air passages; and such bacterial invasion might lead to supuration and gangrene." Similarly, Aschner<sup>2</sup> felt that secondary infection of an aseptic infarct could result in a pulmonary abscess. Kirklin and Faust<sup>3</sup> included abscess formation as one of eight possible complications of pulmonary infarction. Lord,<sup>4</sup> Sante,<sup>5</sup> and Lilienthal<sup>6</sup> in their texts all admitted that such a lesion may develop, but they gave no statistics. In his discussion of the symptoms of pulmonary embolism, Bingold<sup>7</sup> pointed out that frequently emboli present only localized pains in the thorax. After the pains the sputum becomes hemorrhagic or an abscess is formed. While Gsell<sup>8</sup> did not report cases of such abscesses, he felt certain that they did occur. Ceelen<sup>9</sup> stated that bronchogenic dissemination of micro-organisms may bring about suppuration of a pulmonary infarct. Murray and MacKenzie<sup>10</sup> in their studies of postoperative thrombosis and embolism found two cases of pulmonary abscess among 349 cases of pulmonary embolism. They felt that these abscesses were due to infarcts which had become secondarily infected, not by bacteria carried in the embolus. Steinberg and his associates<sup>11</sup> presented four cases of empyema which followed

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bland infarcts that had gone on to abscess formation. Touroff<sup>12</sup> described a similar case of intrapulmonary empyema. The largest series presented is that of Chester and Krause<sup>13</sup> who reported seventeen cases of abscess which developed subsequent to bland infarction. These were found in a review of 344 cases of infarction in which necropsy was carried out. A study of literature concerning pulmonary abscesses was made and only several additional instances of bland infarction as precursor to abscess were found.

#### *Criteria for Selection of Cases*

The selection of cases for this study was not always easy. Probably the greatest difficulty was in deciding whether or not an infarct was a bland one. This was especially true in cases in which operation had been performed and the chance for wound infection was ever present. This possibility was emphasized by Culp<sup>14</sup> in his analysis of eighty-eight cases of pulmonary abscess, four of which he felt were due to infected infarcts. These four patients had had severe wound infections and septicemia. The work of Cutler<sup>15</sup> and of Holman and Mathes<sup>16</sup> demonstrated rather well the fact that pulmonary abscess can develop in a bland infarct in cases of wound suppuration. Consequently, any cases in which infection at the operative site was present prior to the time of infarction were omitted.

All cases of septicemia were excluded.

In many cases the abscess was considered to be secondary to postoperative bronchopneumonia and if the diagnosis of bronchopneumonia could be definitely established, the case was eliminated from this series.

Another decision that needed to be made was whether cases in which thrombosis of the peripheral veins, that is, thrombophlebitis, preceded the abscess should be included in this series. Any hesitancy to include such cases would have to stem from the belief that every case of thrombophlebitis is a case of infection of the vein as several workers, especially the earlier ones,<sup>17</sup> believed. However, in this study an attempt was made to distinguish between infective and noninfective thrombi according to criteria set forth by Murray and MacKenzie.<sup>10</sup> These authors observed that in the infective type of thrombosis there was much pain and tenderness over the vein but the rest of the leg showed little or no swelling. In such cases a septic fever (temperature ranging between 100° and 104° F.) developed and the leukocyte count was as high as 31,000. In the common noninfective type the outstanding feature was swelling of the leg which was usually diffuse and involved the thigh and even the buttock and lower part of the abdomen. Tenderness was slight and the average temperature was usually

about 100° F. There was only a slight degree of leukocytosis. If the thrombus was infected the case was excluded.<sup>18</sup>

In our series all cases in which pathologic evidence of abscess formation was found were included whether or not a cavity had been formed, but no cases of simple necrosis were included.

### *Clinical Study*

*Incidence:* At the Mayo Clinic during the twelve year period from 1932 through 1943, twenty-three cases of pulmonary abscess secondary to bland pulmonary infarction were encountered among 550 cases in which necropsy was performed and infarcts were found. The incidence of this lesion as a complication of pulmonary infarction is 4.2 per cent. During this same period 6,362 complete necropsies were carried out, so that the incidence of this condition is relatively low (0.36 per cent). In only three cases of this group was the diagnosis made clinically. However, at the clinic another group of seven cases were observed in which the diagnosis of abscess secondary to bland infarcts was made, but necropsy was not performed and consequently they were not included in this series.

Of the twenty-three cases which comprise this study, the records of nineteen were available for review. Four cases were not included in the clinical review. These four cases were not studied clinically in the period just prior to death. However, necropsy was performed at the clinic.

*Etiology:* In so far as possible, these records were analyzed with a view to finding some factors that might possibly be considered of etiologic significance. The results of this study are summarized in Table 1. Of the twenty-three patients, only one was less than forty years of age, five were between forty and fifty, and the remaining seventeen were more than fifty. The age incidence is not unusual when it is considered that the incidence of pulmonary infarcts in general is greatest in patients more than forty years old.

Twelve of the patients of this group were male; eleven, female. The sex incidence is comparable to that found by Hosoi<sup>19</sup> for pulmonary infarction in general. He noted no variation in incidence between the sexes. However, in the series studied by Priestley and Barker,<sup>20</sup> infarction occurred one and one-half times as frequently among females as among males. Possibly this might be accounted for by the fact that their study was primarily of post-operative infarction.

Eight of these abscesses occurred during the postoperative period. The eight cases can be further subdivided into two groups. In the first group of five cases inhalation anesthesia (chiefly nitrous oxide, oxygen and ether anesthesia) had been used. In the re-

TABLE 1

Possible etiologic factors in twenty-three cases of bland pulmonary infarction followed by abscess

Factors	Cases
Age, years	
Under 40	1
40 to 49	5
50 and over	17
Sex	
Male	12
Female	11
Postoperative cases	8
Inhalation anesthesia	5
Spinal anesthesia	3
Cardiac decompensation	2
Nonoperative cases	15
Cardiac decompensation	13
Infection, elsewhere	
Pyorrhea	2
Chronic bronchitis	2
Infected tonsils	1
Cold, laryngitis, bronchitis	1
Wound infection after infarction (?)	1
Peripheral venous thrombosis	5
Occurred post infarction	2
Not diagnosed	1
Diabetes	2

maining three spinal anesthesia had been used. Nevertheless, infarction and subsequently abscess developed in both groups. The remaining fifteen patients had not undergone operation. In thirteen of these fifteen cases cardiac decompensation was a factor.

In two cases pyorrhea alveolaris was said to be present. In four others a history of chronic infection of the upper part of the respiratory tract was given; two of the patients in these four cases had had chronic bronchitis; one had had infected tonsils, and one had had a cold, laryngitis and bronchitis for the month prior to his death.

In five cases there was thrombosis of peripheral veins and in one of these it occurred in an antecubital vein. In two others

thrombosis became evident a few days after pulmonary infarction had occurred and in still another case the diagnosis of venous thrombosis was not made clinically, but the condition was discovered at necropsy.

*Symptoms and signs:* In reviewing the symptoms in these cases, it was noted that the time of the occurrence of the infarction could fairly definitely be established in cases in which operation had been performed, but that the time of onset of infarction very frequently was not noted in the cases in which no operation had been performed. The time of onset of the infarct after operation falls well within the period of six to twenty-one days set forth by many writers,<sup>3,21-23</sup> but is a little beyond the four day period which Cutler and Hunt<sup>24</sup> noted. The diagnosis of actual abscess was made clinically when it began to form in only three cases. The patients in these three cases had had a cough which was productive of purulent sputum and this led to the diagnosis. Two other patients had had a cough for a month prior to illness, but this was thought to be due to bronchitis. Nevertheless, the cough seemed aggravated after the infarction took place. Thoracic pain as a symptom occurred in seven cases and in only one was the pain of such a nature that it was not interpreted as being due to some pulmonary difficulty. While hemoptysis was noted in seven cases, it seemed more definitely associated with the original infarction. Dyspnea was found in eleven cases, but only two of the patients were not already suffering from cardiac insufficiency. Cyanosis was associated in two of the eleven cases. On examination, consolidation of the involved lung was found in twelve cases, but only five of the patients were not already suffering from heart failure. Friction rub was observed in two cases.

In nine cases the leukocyte count remained normal, in three others it was elevated to 15,000 per cubic millimeter of blood and in the remaining seven a definite elevation occurred several days after infarction. Any count of more than 15,000, which can be found in a case of simple infarction alone was considered abnormally high. In eleven cases the temperature remained normal throughout the course of the patient's illness. In three cases a low-grade rise in temperature to 100.5° F. was noted. The elevation was of relatively short duration and might be found in cases of infarction uncomplicated by abscess. In six other cases, the temperature ranged between 101.5° and 103° F. and usually began to do so several days after the fever of simple infarction ordinarily would be expected to have subsided. Sputum was blood-tinged in five cases, but patients in three of these had had hemoptysis previously. Unfortunately, bacteriologic cultures of the sputum were not made in these cases. Reports relative to exam-



ination of the sputum were concerned only with the fact that either pneumococci could not be typed or tubercle bacilli could not be found. In the few cases in which blood cultures were made, the results proved to be negative.

*Roentgenologic examination:* The value of roentgenologic examination is questionable, because in only three of the twenty-three cases was there roentgenologic evidence of abscess. Even in these cases the diagnosis of abscess was made on the day, one day after and five days after the patients already had begun to expectorate purulent sputum. Furthermore, in the fourteen cases in which reports of roentgenologic examination were available, the diagnosis of infarction itself was made by this means in only two cases, although it had been suspected clinically in about half of the cases. In the other twelve cases (Table 2) the diagnosis

TABLE 2  
Roentgenologic diagnosis in fourteen cases of pulmonary infarction followed by abscess

Diagnosis	Cases
Infarction	2
Congestion and pleural fluid	4
Pneumonic consolidation	6
Elevated diaphragm	1
Pneumothorax	1

was congestion, pneumonic consolidation or bronchopneumonia, elevated diaphragm and pneumothorax. This is not at all unusual when it is noted that many roentgenologists<sup>3,25,26</sup> are in fairly close agreement that only a small proportion of infarcts show the typical pyramidal form and therefore frequently are missed. The diagnosis of congestion in four cases is not to be considered in particular error since in many instances infarction occurs in cases of cardiac decompensation. Concerning the diagnosis of bronchopneumonia, Jellen<sup>25</sup> remarked that frequently surrounding inflammation may be so extensive that an infarct may not be distinguishable from a pneumonic process and distinction between infarction and pneumonia is not always possible at the initial roentgenologic examination.

*Diagnosis:* Considering all these signs and symptoms, even in retrospect, it would be difficult to conclude that an abscess was present, except in the three cases in which purulent sputum had been reported. However, the occurrence of unremitting fever and of leukocytosis in a case in which the patient has had an infarction ought to raise diagnostic suspicion. Similarly an undue amount

of fever in a case of cardiac decompensation should bring to mind the possibility that an infarct has gone on to abscess formation.

In the seven cases in which a clinical diagnosis of abscess was made, and which were not included in this study the course was more typical. Infarction was followed by a relatively quiescent period which in turn was followed by a rise in temperature and leukocyte count plus cough productive of purulent sputum. These cases are more definitely similar to the seventeen cases presented by Chester and Krause.<sup>13</sup> It is interesting to note that among the patients in our seven cases not one had any cardiac ailment and in all seven cases the condition occurred postoperatively. However, the degree of rise in temperature and of the leukocytosis were approximately the same as in the group in which necropsy was performed and the presence of abscess might have been suspected ante mortem.

Perhaps before leaving the clinical aspects of this study, it might be well to compare the symptoms of abscesses which develop after bland infarction with those of abscesses which develop after infarction due to an infected embolus. A group of twenty-five such cases were analyzed. These cases by no means represent the total cases of this condition in the records of the Mayo Clinic. The most notable differences between the two groups of cases were that in the cases in which an infected embolus was present the temperature was consistently higher and septic in nature, that the leukocyte counts were for the most part higher, and that the patients were definitely more ill. The temperatures tended to range between 102° and 106° F. An analysis of the leukocyte count showed that in six cases the counts ranged between normal and 15,000 per cubic millimeter of blood; in eight cases, the counts were between 15,000 and 20,000 and in six cases, the counts were more than 20,000. In four cases leukocyte counts were not recorded. In nineteen of the twenty-five cases the condition occurred postoperatively. Results of culture of the blood were found to be positive in twelve cases.

On the whole, little difficulty should be encountered in the clinical distinction between an abscess which develops after bland infarction and one which is the result of a septic embolus and infarction. In the light of this distinction, the term "infected infarct" seems rather loose because it is not clear whether such an infarct was infected secondarily or primarily at the moment the embolus became lodged.

#### *Pathologic Study*

Offhand it would seem that the hemorrhagic necrotic region of infarction would provide an extremely adequate culture medium

for the growth of organisms. Fisher and Finney<sup>27</sup> remarked that it is recognized clinically that pulmonary tissue in which infarction has occurred is very susceptible to infection. Yet because of the relatively low incidence of suppurative complications of infarction, the validity of this statement must be questioned. In an effort to determine what there is about lung tissue that resists the onslaught of infective agents or what causes a lowering of the protective barrier in the few cases in which abscess develops, this series of cases was studied from a pathologic point of view.

*Location of the abscess:* Table 3 contains the results of analysis of these cases with respect to the location of the abscess within the various lobes of the lungs. As noted, most of these abscesses

TABLE 3  
Location of lesions in twenty-three cases\* of pulmonary infarction followed by abscess

Location	Cases	Location	Cases
Right lung	20	Left lung	9
Upper lobe	6	Upper lobe	1
Middle lobe	3	Lower lobe	8
Lower lobe	11		

\*Lesions occurred in two lobes in 6 cases.

occur in the lower lobes, and this finding is consistent with the findings of many workers<sup>13,27-30</sup> in regard to the location of infarcts in general. In eleven of nineteen cases in which the abscesses were in the lower lobes evidence of cardiac decompensation was present. In six cases, two lobes were involved. This definitely differs from the findings in the cases of septic infarcts in which many abscesses involve several lobes or many abscesses develop within a single lobe. It is interesting to note that in eleven of the twenty-five cases of septic infarct abscesses had developed in other organs of the body, while in the group of twenty-three abscesses after bland infarctions, no other organs were involved.

*Size of infarction:* Lemon and his co-workers<sup>31</sup> felt that the development of an abscess depended in large part upon the size of the occluding thrombus and the resultant infarctions of pulmonary tissue. When the infarcts are so large that asphyxia of the central tissues results, softening and liquefaction occur. But, is such a necrotic softening of itself an abscess? In this study, as in the one by Chester and Krause,<sup>13</sup> cases in which only necrotic softening occurred have been omitted. However, when the size of the region of infarction and of the abscesses was noted, it was found that abscesses develop in very large or very small

infarcts. The largest in this series occupied approximately one third of a lobe, while the smallest was but a few millimeters in diameter. However, the majority of the abscesses have occurred in regions of infarction that are fairly large—more than 2 cm. in diameter—and in only three cases was the region of infarction less than 1 cm. in any diameter. This again differs somewhat from the picture found in the group of septic infarcts, since in that group many small regions of infarction developed into abscess.

*Circulation:* Any discussion of the size of an infarct quite naturally leads to a consideration of the state of the circulation in and about the region of infarction. From a review of the sections in these cases, it can be stated that the evidence of circulation within the region of infarction was practically nil. The state of the circulation in the region of infarction may be a factor in the occurrence of infection.

Mathes and her co-workers<sup>32</sup> showed by means of injection of a radiopaque medium that the bronchial artery supplying the portion of the lobe in which the embolus was located became progressively enlarged until after ten to fourteen days it was very tortuous and many times its normal size. The artery could be seen as it followed the course of the bronchus and many of its large branches entered the region of the embolus. However, there is some question whether this dilation of the bronchial vessel actually assists in supplying the region of infarction with blood. Studies of Karsner and Ghoreyeb<sup>33</sup> demonstrated that, although increases in pressure in the bronchial arteries cause somewhat greater inflow of the mass injected into the bronchi into the region of the embolus, extremely high pressures are not sufficient to provide for complete circulation within the region of infarction. On the other hand, in our cases the blood supply seemed to be abundant about the region of infarction, and in those sections in which the infarct was shown in proximity to the pleura, marked dilation and congestion of the vessels within and beneath the pleura was seen. Furthermore, the larger the region of infarction, the less likely was the more central part of the infarct to receive an adequate supply of oxygenated blood.

Perhaps Welch<sup>1</sup> made a pertinent statement when he stated that, "The fate of a part supplied by an artery closed by a bland embolus depends altogether on whether it is fed within a certain time after the obstruction with enough arterial blood to preserve its function and integrity."

That the mechanism for an adequate collateral circulation is present in cases of infarction has been demonstrated by Ghoreyeb and Karsner<sup>34</sup> and by Mathes and her co-workers.<sup>32</sup> According to Mathes and her co-workers, the blood supply relayed by the



collateral arteries from the bronchial artery is adequate. The artery becomes dilated to assist in speedy repair of the region of infarction. Perhaps it is this dilation which allows enough arterial blood with its oxygen and its cellular elements to be brought to the region of infarction—enough at least to combat any low-grade infection, to aid in rapid healing and to prevent abscess formation.

*Source of infection:* By the criteria laid down earlier in this paper, organisms carried by the original embolus were ruled out as a possible source of infection in this series. However, the possibility still exists that a bland infarct may become infected subsequently by organisms which entered the blood stream after the original bland infarction had taken place. In fact, Holman and Mathes<sup>16</sup> were able to produce experimentally suppurative conditions of bland infarcts by causing suppurative wounds in the experimental animal at a later date. Of course there always exists the moot question as to whether or not a negative blood culture means an absence of circulating organisms.

A review of sections of tissue and emboli stained with brown Gram stains taken in all of our cases revealed that in fourteen of them organisms were present in pulmonary tissue, in the abscesses or in the region of infarction, but in no case were organisms seen within the blood vessels. This evidence might be of questionable value were it not for the fact that in a similar study of septic infarcts and abscesses resulting from them, organisms were demonstrated more readily within the blood vessels. Another distinguishing fact in the cases of septic infarct was that arteritis or arteriolitis frequently was present.

In a study by Naidu,<sup>35</sup> pulmonary tissue was cultured at necropsy in seventy-five cases and in sixty-seven of these cases positive results were found. The organisms found were micrococci, non-hemolytic streptococci, *Staphylococcus albus* and hemophilic bacilli. He questioned the fact that the presence of the bacteria per se in tissues contributes to the illness, but he suggested that the liberation of toxins by these organisms is the chief means of harm. That some of these organisms, in addition to the pneumococcus and the *Streptococcus haemolyticus*, might become pathogens and consequently be the infective agents in these cases is not to be denied. Unfortunately, little can be said concerning the organisms in our series, since postmortem culture of pulmonary tissues was made in only one case. The organisms were of the streptococcus group. Of the fourteen cases in which organisms were seen by study with Gram stains, all but one showed cocci. That one case presented a mixed infection due to rods and cocci.

Cutler<sup>36</sup> concluded that normally the epithelial lining of the bronchi has a high resistance to infection. The abscesses which

he was able to produce experimentally were developed by secondarily infecting atelectatic regions. Yates,<sup>37</sup> too, felt that a bland embolus would not cause an abscess to be formed unless the atelectatic portion of the lung were invaded by bacteria from a bronchus.

In our study in fourteen of the twenty-three cases regions of atelectasis were found adjacent to the region of infarction and abscess. More interesting is the fact that in eighteen of these cases pus was demonstrable in the bronchi even though clinical history of purulent sputum was given in only three cases. In a few cases evident bronchitis and bronchiolitis were present. Determining whether this bronchitis was a factor in the cause of the abscess or the result of the abscess is quite a problem. It is our belief that in many of these cases of infarction there is a concomitant low-grade bronchitis. As Hampton and Wharton<sup>23</sup> pointed out, this might be especially true during the first post-operative week, for during that time there is mild bronchitis due to the irritation of anesthesia. In cases of cardiac decompensation low-grade bronchitis is present. Consequently an infarct in the lungs in such cases might furnish an ideal culture medium in which a low-grade infection might develop into full virulence.

Another source of infection that is not to be overlooked is the buccal and pharyngeal regions. While in our series some upper respiratory or dental infection was present in only six cases, these regions loom large as possible sources for organisms. In a six-year period Kline and Berger<sup>38</sup> gave preoperative oral therapy with the result that in 5,078 operations, postoperative pulmonary complications occurred in only nine cases (0.17 per cent). In a similar period sixty (0.68 per cent) of 8,897 untreated patients had pulmonary complications. Cutler<sup>36</sup> felt that secondary infection might be brought about readily by the aspiration of buccal material during sleep. Crowe and Scarff,<sup>39</sup> Allen,<sup>40</sup> Hedblom, Joannides and Rosenthal<sup>41</sup> all concluded, however, that in order for infection to take place by aspiration, the cough reflex must be controlled sufficiently long to allow infected liquids to settle into the alveoli. On the other hand, Faulkner and Faulkner<sup>42</sup> showed the influence of "internal drainage" in spreading infection from one part of the tracheobronchial tree to another and demonstrated that even without the abolition of the cough reflex, iodized oil introduced into the nares before sleep finds its way into the bronchial tree by the following morning. Lemon<sup>43</sup> demonstrated that when a dog is anesthetized the foot of the table must be 28.75 cm. higher than the head in order to prevent the spread of buccal material downward. These findings are mentioned to give some strength to the idea that the source of the

infective agent in the development of an abscess from a region of bland infarction might well be derived from the tracheo-bronchial system.

Empyema occurred in six of our twenty-three cases. In their series Chester and Krause<sup>13</sup> reported seven cases of empyema. The occurrence of this lesion should not be thought unusual as a complication of abscesses which develop in regions of bland infarction, since such regions are almost always near the periphery of the lung and consequently are in a position to allow spread of infected material into the pleural space more quickly.

### SUMMARY

Findings in twenty-three cases of pulmonary abscess which developed after bland pulmonary infarction are presented and are analyzed.

While the diagnosis was definitely established clinically in only three cases, it is felt that abscess formation should be suspected in any case of infarction in which leukocytosis, unremitting fever and possibly a productive cough develop subsequently.

Pulmonary infarcts are especially prone to develop in cases of cardiac decompensation and in any case of cardiac disease in which illness has been prolonged and unremitting fever has been present the possibility of abscess formation should be considered.

A distinction should be made clinically between septic and aseptic embolic infarction. The term "infected infarct" should not be used unless the mode of infection is made clear.

In so far as the pathogenesis of these abscesses is concerned, it can be concluded that their development in a region of bland infarction depends upon the following factors:

- 1) The size of the region of infarction: the larger the region of infarction, the better the chances for abscess formation.
- 2) The state of blood supply to the region of infarction and the adequacy of collateral circulation.
- 3) The state of the surrounding pulmonary tissue, including such factors as coexistent congestion or atelectasis.
- 4) Bacteriologic factors, which include the presence or absence of dental, buccal and pharyngeal infections; the presence of bronchitis; the virulence of the organisms involved, and the massiveness of the infection.
- 5) The indeterminate, but apparently actively operating, factor of "tissue resistance" to the development of such abscesses in what, at first sight, appears to be a very fertile field for the growth of bacteria.

## RESUMEN

Se presentan y analizan los hallazgos en veinte y tres casos de abscesos pulmonares que se desarrollaron después de infartos pulmonares leves.

Aunque solamente en tres casos se estableció el diagnóstico clínico bien definido, se opina que se debe sospechar la formación de absceso en todo caso de infarto en el que subsiguientemente aparecen leucocitosis, fiebre continua y, posiblemente, tos productiva.

Los casos más propensos al desarrollo de infartos pulmonares son los de insuficiencia cardíaca, y en todo paciente cardíaco que ha estado mal por mucho tiempo y que ha tenido fiebre continua, debe considerarse la posibilidad de formación de absceso.

Se debe hacer la distinción clínica entre infartos embólicos sépticos y asepticos. No debe usarse el término "infarto infectado" a menos de que sea claro el modo de infección.

En cuanto a la patogenia de estos abscesos, se puede concluir que su desarrollo en un lugar de infarto leve depende de los factores siguientes:

- 1) El tamaño del infarto: mientras más grande el infarto, mayor es la oportunidad para la formación de un absceso.
- 2) El estado del riego sanguíneo en la región del infarto y lo adecuado de la circulación colateral.
- 3) El estado del tejido pulmonar circundante, inclusive de factores tales como congestión o atelectasia coexistentes.
- 4) Factores bacteriológicos, que incluyen la presencia o ausencia de infecciones dentales, bucales o faríngeas; la presencia de bronquitis; la virulencia de los gérmenes en cuestión y la masiva de la infección.
- 5) El factor indeterminado, pero aparentemente activo, de la "resistencia del tejido" al desarrollo de tales abscesos en el que parece ser, a primera vista, un terreno muy fértil para la multiplicación de bacterias.

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## Pneumoperitoneum\*

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Spencer Wells,<sup>1</sup> in 1872, opened the abdomen of a woman with tuberculous peritonitis and subsequently noted the marked improvement which followed this operation. In 1893, Mosetig-Moorhoff and Nolan<sup>1</sup> independently showed that laparotomy is not necessary for the healing of tuberculous peritonitis; the air accomplishes the same thing if introduced by needle. In 1933, Vajda,<sup>1</sup> while trying to control pulmonary hemorrhage in a patient with dense pleural adhesions, injected enough air into the abdomen to elevate both leaves of the diaphragm and in this manner controlled bleeding. Joannides and Shlack<sup>1</sup> in 1936, proposed that the phrenic nerve be crushed before instituting artificial pneumoperitoneum. Since 1931, Banyai<sup>1</sup> has studied and extensively written on the beneficial effects obtained from pneumoperitoneum in the treatment of pulmonary tuberculosis.

Pneumoperitoneum, with or without the addition of phrenic nerve crushing, is a form of pulmonary collapse therapy; i.e., its chief purpose is to promote healing of the lung through reducing its volume. Collapse therapy is generally thought to be effective<sup>2</sup> by encouraging elastic relaxation of the lung and thus affording rest to the affected part and possibly by inducing anoxemia and lymph stasis, both of which are presumed to favor fibrosis of exudative lesions; there is also some evidence that collapse therapy actually causes compressions of the walls of cavities, thus placing these in optimal position for healing.

The indications for and contraindications<sup>3</sup> to the practice of pneumoperitoneum have been widely discussed in the literature. We believe that this procedure is best used after the phrenic nerve has been crushed or cut. Since each patient presents his own individual problem, we do not believe that categorical statements can be justified. Suffice it to state that this combined method is indicated generally whenever and wherever collapse therapy is indicated but no other method is feasible; it is contraindicated when the patient is too sick to tolerate any form of mechanical treatment for his tuberculosis.

### *1. Effect of artificial pneumoperitoneum on pulmonary volume:*

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Crushing or cutting the phrenic nerve is followed by paralysis of the corresponding half of the diaphragm, and the paralyzed diaphragm rises unless fixed by adhesions to the chest wall or to a stiffened lung. This rise reduces the vertical diameter of the lung, thereby lessening the pulmonary volume; following the introduction of air into the peritoneal space, this reduction in pulmonary volume is accentuated. Contrary to general opinion, the diaphragm, during pneumoperitoneum treatment, is not elevated by intra-abdominal pressure alone,<sup>4</sup> but also by neutralizing the subdiaphragmatic negative pressure and thus permitting free play for the upward pull of the intrapleural pressure. Although phrenic crush itself usually causes a reduction in vital capacity, Banyai<sup>1</sup> found that the combination of phrenic crush and pneumoperitoneum seldom lowered the vital capacity more than 15 per cent. Arterialization of the blood proceeds at a normal rate.

*2. Effect of artificial pneumoperitoneum on the heart and circulation:* One of the more important advantages of artificial pneumoperitoneum as a form of collapse therapy is that it puts comparatively little strain on the heart and circulation. Whereas other forms of collapse therapy, notably artificial pneumothorax and thoracoplasty, do materially reduce the respiratory efficiency of patients, pneumoperitoneum does not. Berg and Benatt<sup>4</sup> could not find even a consistent lowering of vital capacity in their series. It is true that after a phrenic nerve crush there is reduction in the volume of tidal air, but these changes are transitory. It is significant that the cardiac output is increased about 25 per cent when the ventilated volume decreases 13 per cent, indicating that the increased cardiac output compensates for the decreased pulmonary volume, thus increasing the utilization of oxygen from the air.

Patients treated by artificial pneumoperitoneum have demonstrable electrocardiographic patterns markedly similar to those of acute cor pulmonale. Thus there will be found flattened ST interval in Lead II, large Q wave followed by small R and inverted T in Lead III. It is important to realize that these changes are not due to cardiac disease itself but to a predictable change in rotation of the heart about a horizontal axis lying in the sagittal plane; i.e., the apex of the heart is generally moved upwards and to the left. Studies of the ventricular gradient confirm this view. It is our custom to obtain electrocardiograms immediately prior to and subsequent to the introduction of air into the abdomen as a means of studying these changes. Failure to realize that these changes markedly resemble those seen when acute pulmonary embolism develops may be responsible for diagnostic errors. Benatt and Berg<sup>4</sup> call attention to the fact that these changes



are reversible and disappear completely on completion of pneumoperitoneum and return of the diaphragm and heart to the respective pretreatment anatomical positions.

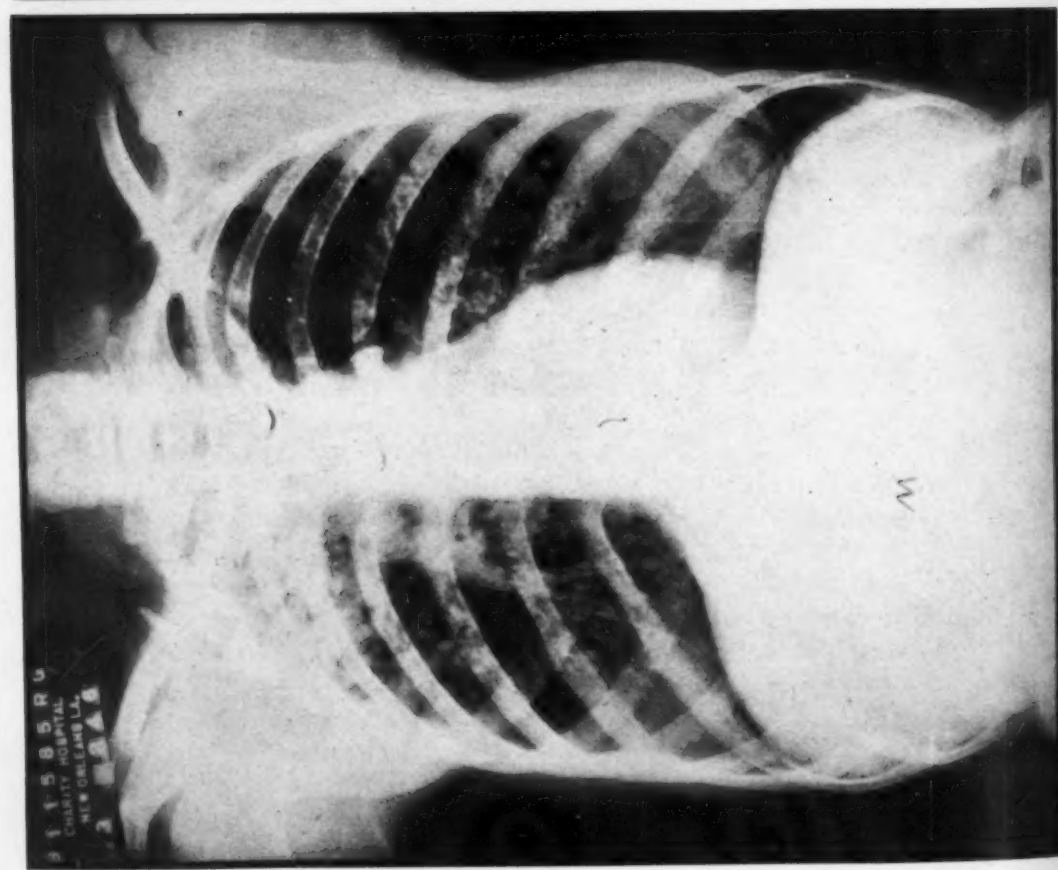
### *Technic*

A standardized technic<sup>5</sup> has been published. We believe that attention to certain details is important. The easiest site is the area just below the left costal margin and lateral to the rectus sheath; false passage of the needle is not probable if this site is used. The beginner can estimate the depth of the abdominal wall by the fact that the patient gasps with pain, as soon as the infiltrating needle touches the peritoneum; a small amount of procaine speedily abolishes this pain. Although at times no manometric fluctuation is obtained, usually the pressure is recorded as subatmospheric or negative; after a small amount of air flows through the needle, the pressure is positive but soon becomes negative once more as the accomodating effect of the abdominal muscles manifests itself.

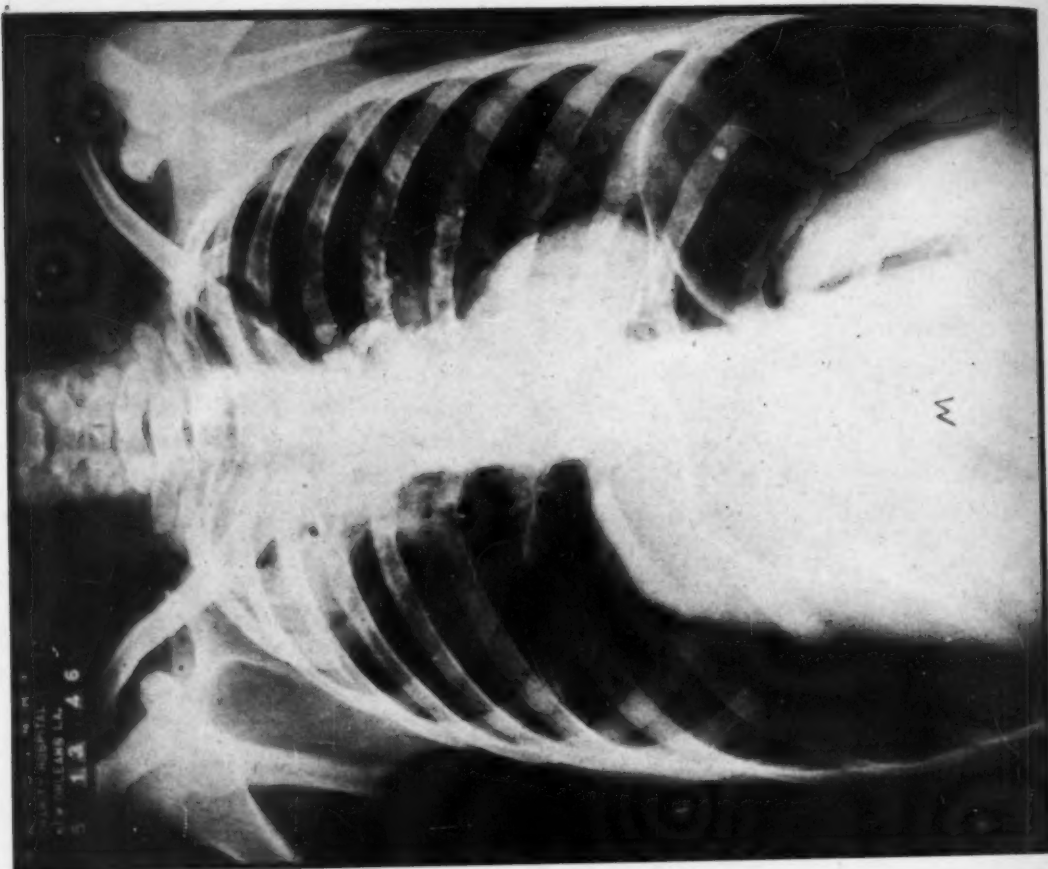
Usually the treatment is repeated at intervals of 2 to 3 days until a satisfactory degree of pneumoperitoneum can be demonstrated at fluoroscopy by adequate rise of the paralyzed diaphragm. Then it is generally sufficient to insufflate 1000 cc. of air weekly. Some of our patients need as much as 1800 cc. of air weekly, but this is exceptional. The first treatment may be followed by abdominal discomfort or pain in the shoulder from diaphragmatic irritation, but most patients soon tolerate the air quite well. As the abdomen begins to bulge from the stretching effects of repeated injections of air, the intra-abdominal pressure increases to the point where there is no longer a negative reading 30 minutes or more after completion of a given treatment.

### *How Effective is Pneumoperitoneum Therapy?*

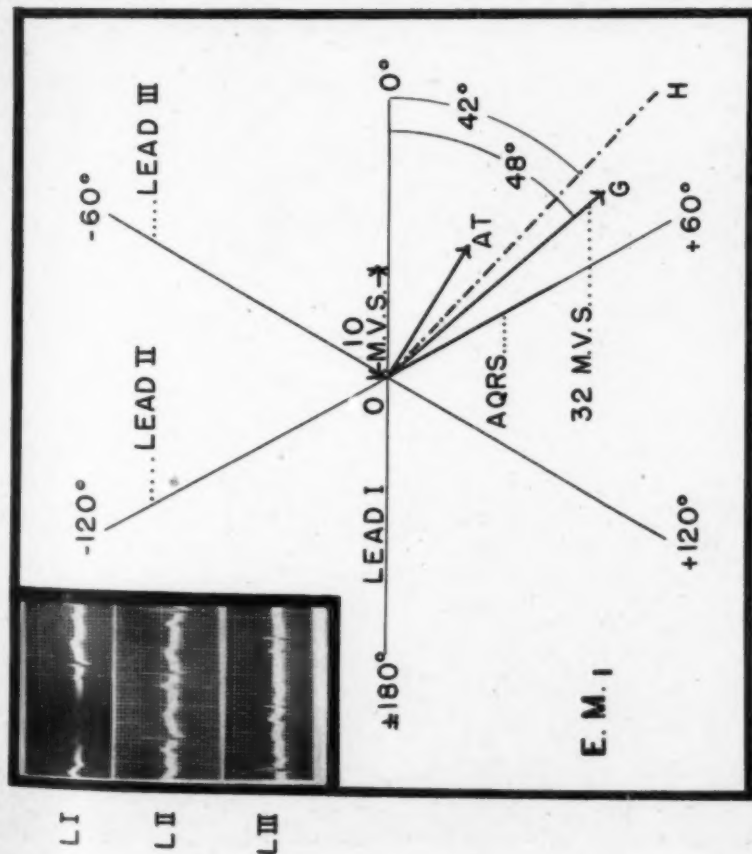
Because pneumoperitoneum therapy, during its early period, was instituted only for hopeless cases, the reported results have not been brilliant. Unless one appreciates that the benefits are those which are extended, for the most part, to patients otherwise doomed to die from progressive pulmonary tuberculosis, he will not be impressed by the apparent cures attained. Despite this, however, several favorable series of cases have been recorded<sup>6,7,8</sup> There may be some question, when pneumoperitoneum is combined with phrenic nerve crushing, which procedure was the more effective. Most authors tend to attribute more good results to the combination than to either of the methods alone. This is still a clinical impression and has not yet been supported by adequate statistics.



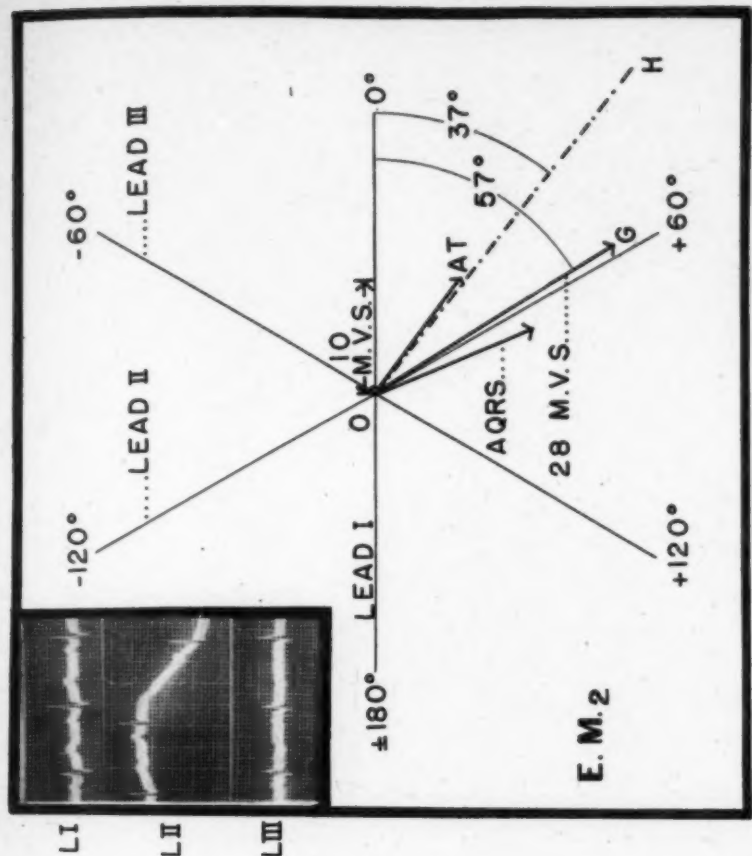
(a)



(b)



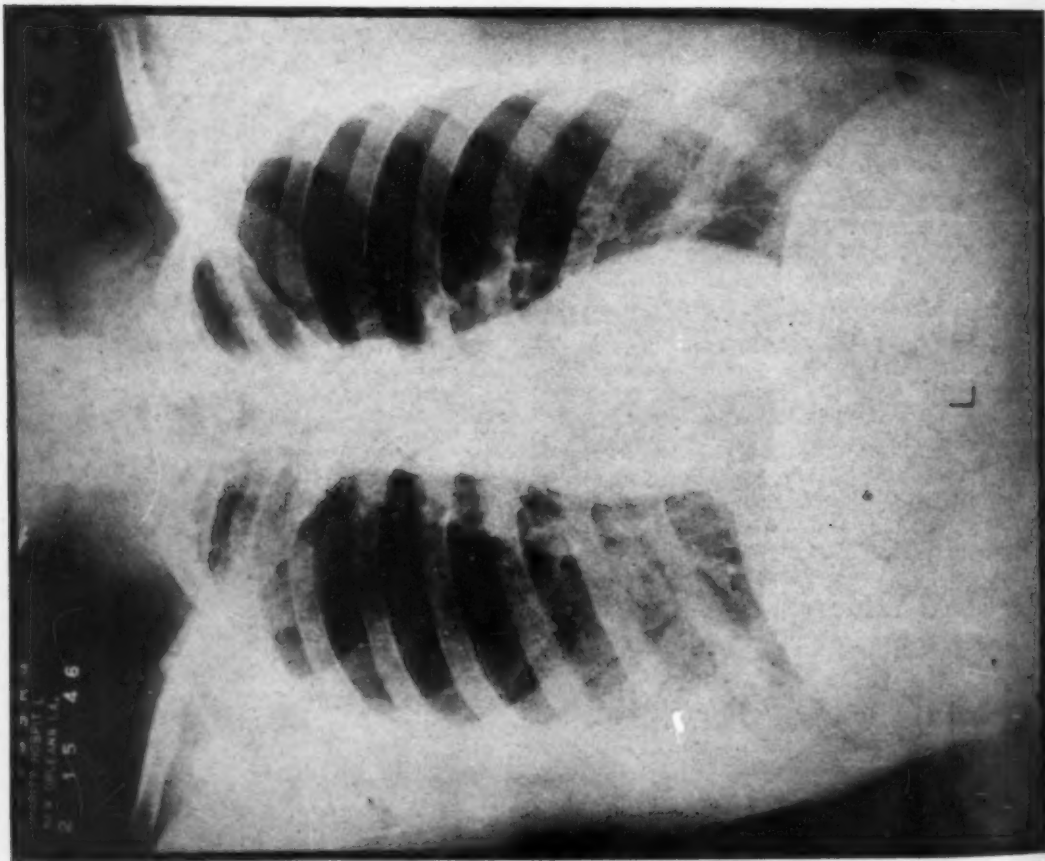
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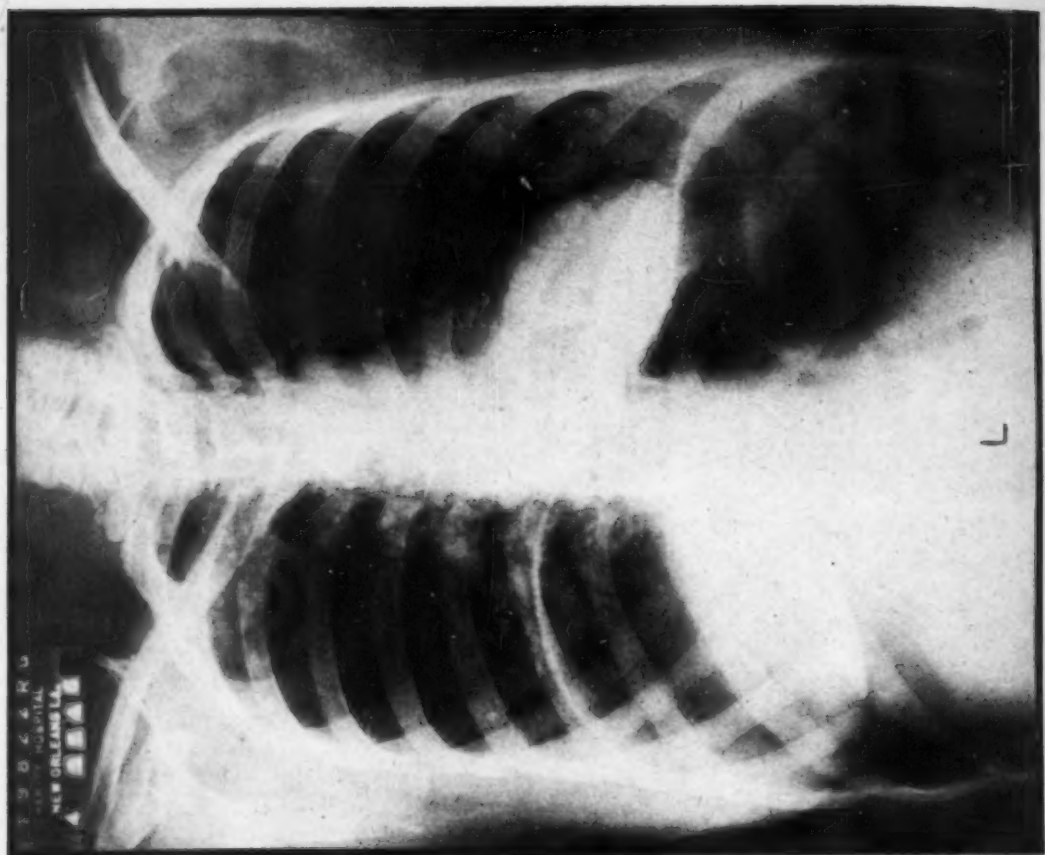
(b)

FIGURE 1: The triaxial reference system suggested by Bayley<sup>14</sup> has been used to analyse the forces concerned with the electrocardiogram. The following nomenclature has been employed: G - Ventricular gradient as projected on the frontal plane of the body; AQRS - mean manifest magnitude of the QRS complex determined algebraically and measured in microvolt seconds to represent the mean force of the depolarization process of the ventricular musculature; H - the anatomic or longitudinal axis of the heart as projected on the frontal plane; and AT - the manifest mean magnitude of the repolarization process of the ventricular musculature.

The chest x-ray film and electrocardiogram shown in (a) above were taken before initiation of pneumoperitoneum. G has a magnitude of 35m. v. s. and a direction of plus 67° while the anatomic axis is at plus 50°; these values are normal. After initiation of pneumoperitoneum (b), G has rotated to the right and is now 105° whereas H rotated to the left and is now at plus 35°. These results indicate that clockwise rotation of the heart has occurred although the longitudinal axis of the heart was shifted in a counter-clockwise direction.



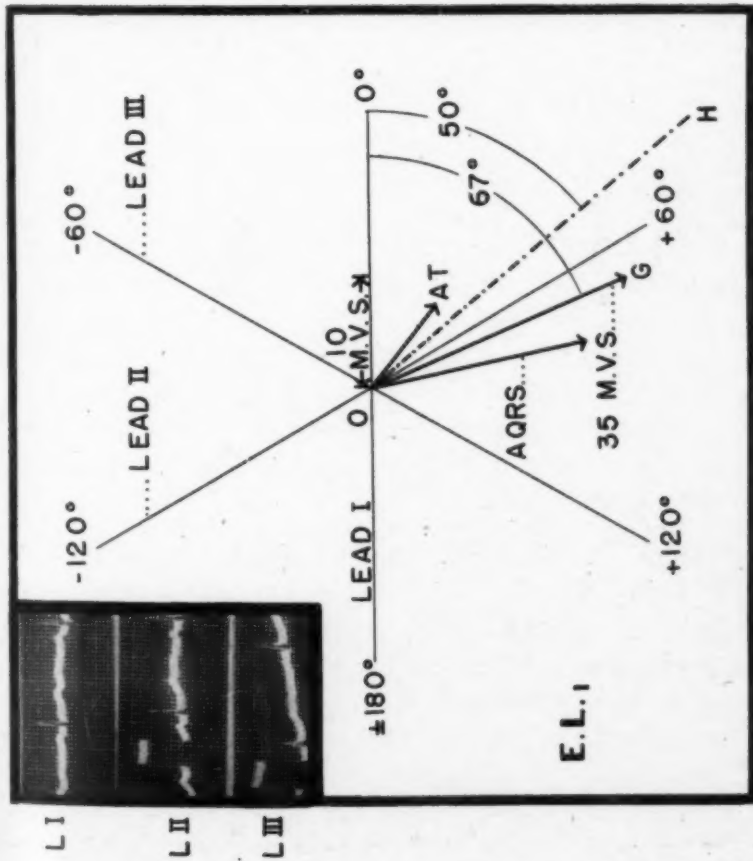
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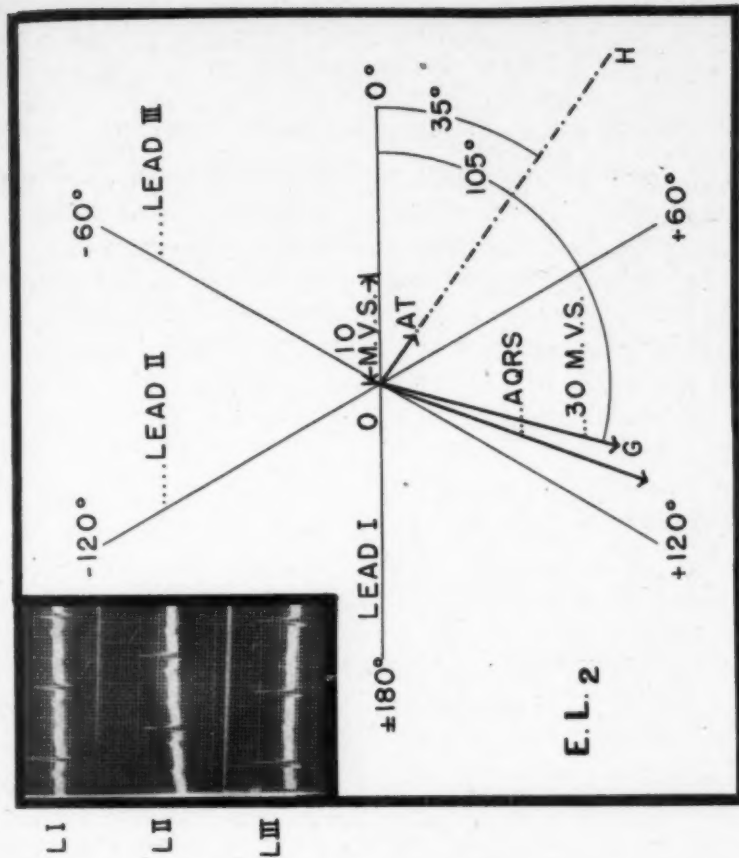


(a)



(a)

(b)



(b)

FIGURE II (Legend as for Fig. I): The chest x-ray film and electrocardiogram made before institution of pneumoperitoneum (a) indicate G at plus 48° and H at plus 42°. After pneumoperitoneum was established (b), G shifted to plus 57° while H rotated counter-clockwise to plus 37°. This indicates that there has been clock-wise rotation of the heart about its antero-posterior axis.

### *Complications of Pneumoperitoneum Therapy*

1. *Visceral Injury* is a naturally feared but seldom encountered accident. Biernaki,<sup>1</sup> in an effort to show that injury to the bowel does not occur, inserted standard pneumothorax needles into the abdomen of cadavers 2 centimeters past the peritoneal limits; in no instance was he able to injure the intestine. To minimize the possibility of this accident, we do not insert the needle near the surgical scars of laparotomies where a loop of the gut may be adherent and also insist on an empty bladder and an empty stomach as prerequisites for each refill. We do not initiate pneumoperitoneum during menstruation for fear of inciting or aggravating dysmenorrhea.

2. *Air embolism* is a serious complication not often encountered in artificial pneumoperitoneum. Fremmel<sup>9</sup> reported only one instance in 218 refills. Others have reported similarly on the rarity of the occurrence, and yet some fatalities have been listed by Trimble,<sup>10</sup> Simon<sup>11</sup> and Warring.<sup>12</sup> The symptoms are precisely the same as when it complicates artificial pneumothorax, and the management is also the same.

3. *Accidental injection of air into the thorax and into the skin* usually follow a bout of coughing or some effort as rising abruptly from a horizontal to a sitting posture. Accidental pneumothorax seems to have occurred mostly if the pneumoperitoneum had been attempted through the subdiaphragmatic route. Mediastinal emphysema may ensue when air escapes through one of the openings of the diaphragm or, more probably, if a sudden straining act initiates interstitial pulmonary emphysema by rupturing an alveolar base. Under these circumstances, bubbles of air dissect the sheaths of blood vessels entering the mediastinum at the hilum of the lung. This explanation has been offered by the Macklins.<sup>13</sup> If the volume of air is large, the patient will have severe retrosternal pain associated with dysphagia and dyspnea. Subcutaneous emphysema is an interesting, but usually harmless, complication first noted by the patient when he feels the crepitations over the abdomen. Through the bell of a stethoscope, a characteristic sound may be demonstrated.

4. *Atelectasis* is a rare complication due to obstruction of bronchial drainage.

5. *Ascites and peritonitis* (analagous to the pleural effusion which complicates artificial pneumothorax) may be seen in about 1 per cent of cases, occasionally leading to adhesive peritonitis and abandonment of this form of therapy.

## SUMMARY

1) The combination of phrenic crush and pneumoperitoneum is a valuable form of pulmonary collapse therapy.

2) When used as part of a collapse therapy program in tuberculosis, it increases the percentage of patients who can be brought to the stage of "apparent cure."

3) The technic is simple, and the complications few.

4) It should be used for any patient suited to collapse therapy but not suited to thoracoplasty or to artificial pneumothorax.

5) When the indications have become better established, it is possible that it may supplant some of the now more commonly employed measures. Until the demonstration of such indications, it should be used only in conjunction with, and not instead of, other measures.

6) Satisfactory results may be expected only if there has been a satisfactory rise in the diaphragm with corresponding pulmonary relaxation.

7) The electrocardiographic pattern obtained is similar to that of acute cor pulmonale but can be shown to be due to cardiac rotation with corresponding movement of the ventricular gradient.

## RESUMEN

1) La combinación de trituración del frénico y neumoperitoneo es una forma valiosa de colapsoterapia pulmonar.

2) Cuando se emplean como parte del programa de colapsoterapia en la tuberculosis, estas medidas elevan el porcentaje de pacientes en los que se puede producir el estado de "curación aparente."

3) La técnica es sencilla y las complicaciones pocas.

4) Debe emplearse en cualquier paciente en el que sea apropiada la colapsoterapia pero que no sea adaptable a la toracoplastia o al neumotórax artificial.

5) Cuando se establezcan mejor las indicaciones, es posible que reemplaze a algunas de las medidas que se emplean más comúnmente ahora. Hasta cuando se demuestren estas indicaciones, sólo debe usarse junto con estas medidas y no en vez de ellas.

6) Sólo pueden esperarse resultados satisfactorios si ha ocurrido una elevación satisfactoria del diafragma con la correspondiente dilatación pulmonar.

7) El patrón electrocardiográfico obtenido es semejante al del cor pulmonale, pero se puede demostrar que se debe a rotación del corazón con movimiento correspondiente de la inclinación ventricular.

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## Progress in Tuberculosis Control in the United States\*

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At last year's Annual Meeting, it was my pleasure to discuss in general terms the tuberculosis control program of the United States Public Health Service. I described the fundamental objectives and major techniques of the Tuberculosis Control Division, organized as an official agency to integrate and guide activities in tuberculosis control throughout the country. I spoke of the success of the Division in cooperative work with voluntary and official State and local agencies engaged in the national control movement, and mentioned cooperative arrangements with prominent research groups. That introduction to the activities of the Division was in itself a promise to speak later of further developments.

Today, with the Division in its fourth year of operation, it is possible to discuss, in some detail, significant projects and results. The most interesting work, I should say, has been in the fields of case-finding and medical research. It would seem appropriate to discuss case-finding first, inasmuch as it provides a measure of the general problem of tuberculosis.

For those who may not be familiar with the Federal case-finding program, I should explain that the Public Health Service operates a number of photofluorographic units for demonstration purposes. At present the Tuberculosis Control Division maintains more than 40 of these units and keeps at least 35 in operation at all times. While demonstrating the value of miniature chest films in detecting early tuberculosis, the units provide direct service to the community, and every effort is made to place them where most needed throughout the States.

The Division frequently conducts chest x-ray surveys among special population groups, such as industrial workers or patients in mental hospitals. These investigations afford valuable information about the tuberculosis problem. For the most part, however, we emphasize the community-wide survey, since it covers the general population as well as special groups, and in this way offers the most to the people in terms of service. In demonstra-

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tions of this type, we attempt to obtain a chest film of every community member 15 years of age or older. The Division has participated in several case-finding surveys in which entire counties were covered—an approach so successful that we hope to further a national program of tuberculosis case-finding by communities.

One of the primary considerations in a large community-wide survey is the time element. We must discover and isolate as soon as possible a sufficient number of open cases to provide a marked reduction of disease hazard for the remaining population. Moreover, the Public Health Service, in the interest of the nation as a whole, must avoid a prolonged concentration of x-ray units in one area. Then again, the problem of waning community interest in the program enforces the time restriction. For these reasons, careful planning and strong community organization are essential.

Basic to any case-finding program is the question of support for the survey. In community-wide demonstrations, the Division furnishes standard, fully automatic units employing 70-mm. roll film. Along with these, we assign medical officers for the organization of the survey and interpretation of results, as well as x-ray technicians, nurses, health educators, and reporting methods analysts. In short, the Public Health Service supplies most of the technical personnel and equipment.

The community usually requires outside help to complete the survey within the time limits. In most surveys to date, the State and local health departments have provided funds and personnel necessary for publicity, clerical work, and follow-up. And for cases discovered during the survey, these departments have also provided clinic facilities, nurses, and other workers.

Many groups must take an active part in the planning and organization: the State and local health departments and other official agencies; the voluntary associations, State, local, and others; and working closely with these groups, the private physicians in the area.

At the present time (June, 1947 - Ed.), the Division is engaged in a tuberculosis case-finding survey of Minneapolis. Although the results of film readings are not yet available, I should like to discuss this program in some detail, for the planning and organization are exemplary. There is every indication that this survey will be one of the most successful ever undertaken.

The survey was initiated by the Hennepin County Medical Society, and is being sponsored by the Medical Society, the County Tuberculosis Association, the State Cancer Society, and the City Health Department. Many local groups are active participants, such as the Chamber of Commerce, the PTA, hospitals, labor

unions, the YMCA, and churches. The program is directed by the Minneapolis City Health Department in cooperation with the United States Public Health Service.

The purpose of the survey is to discover pulmonary tuberculosis, cancer in the chest cavity, heart abnormalities, and other pathologic chest conditions among all adults in a total population of more than 400,000. About four months were spent in preparing for the actual x-ray work, which was started May 5, 1947 and was to continue until December.

One of the initial preparatory steps was the organization of a committee to reach into every factory, place of business, school and home, for the purpose of explaining why everyone should have an x-ray and how it would be provided. The activities of the press and radio, and the organization of resources for the printing and distribution of pamphlets, banners, posters, and so forth, are directed by a committee on public relations. The immediate expenses of the survey are met by a contribution from the Hennepin County Tuberculosis Association, and a special finance committee has been delegated to raise additional funds.

As part of the community organization, a chest x-ray attitude poll was taken by a Chicago public relations firm. The object was to determine the attitude of employers and members of the general population toward a complete city-wide program, and to estimate the number that would turn out. One hundred and fifteen employers and 413 other people were interviewed personally by experienced field representatives.

The attitudes revealed by the poll were very encouraging. None of the 115 employers interviewed objected to the survey; only one was uncertain. When asked why they thought it a good idea, 41 employers, or 36 per cent, replied that it would aid the general health of everyone in the city. Twenty-nine, or about a quarter of the group interviewed, said that it would help prevent and control disease. Primarily, the employers wanted the assurance that their employees were free from tuberculosis, and more than 90 per cent agreed to grant their employees time for an x-ray.

The response to the general population poll was further indication of a successful educational campaign. Of the 413 men and women interviewed, 403 said they believed the x-ray survey was a good idea. Four did not think so, and 6 were uncertain. The principal reasons given for thinking it a good idea were that the survey could catch tuberculosis, cancer, and heart trouble in early stages; that it would aid in the general health and protection of the city; and that it would find unsuspected cases and help prevent the spread of disease.

As a further step in the organization of the community, a

technical committee of physicians and nurses was established, with the Tuberculosis Control Officer of the City Health Department as secretary. This committee was responsible for planning the follow-up program, and is actively engaged in making clearances with the medical and nursing professions. The city was divided into five large zones, and these into a total of 30 neighborhood operational districts, according to geographic lines and community group interests. Publicity and subsequent x-ray work are concentrated in certain areas, beginning on the outskirts of the city and progressing toward the center. In many communities, this procedure proved highly effective in war bond and community chest drives.

Three mobile and seven portable photofluorographic units, all employing 70-mm. film, are used in the survey work, and several other units are held in reserve. Radiologists of the Public Health Service are reading the films.

For the follow-up, a confidential report is mailed to each person whose screening film shows evidence of chest pathology. The report directs the person to the Public Health Center, where he is x-rayed again with 14" x 17" film. If further examination is necessary, he is referred to his private physician, who is informed of the x-ray findings; and persons found to have active tuberculosis are reported to the City Commissioner of Health. After the report is sent to the physician, the follow-up is on the normal patient-doctor basis. This phase of the program has been carefully planned, and assumes all possible assistance from professional groups responsible for diagnosis, treatment, and rehabilitation.

But I must turn, now, from the subject of case-finding to say a few words on basic research. The first project I should like to discuss is the study of minimal tuberculous lesions among student nurses, begun in 1943. The Division in cooperation with the National Tuberculosis Association has gradually expanded the Nurses Study to include research in almost all geographic regions of the United States. Approximately 12,000 student nurses in 76 widely distributed schools are systematically x-rayed and skin-tested, to determine the predisposing factors and earliest manifestations of tuberculosis.

A preliminary analysis of material from the study is in progress, with a view to obtaining a measure of the accomplishments made over the past four years. Films from two of the ten cities in the study, Columbus, Ohio, and Detroit, Michigan, were selected for the analysis; and the hospitals in those cities were regarded as though the study had been completed. All chest films were re-read. A correlation of film and skin-test readings will make possible



the first comprehensive interpretation of minimal lesions as revealed by chest x-ray, and will permit evaluation of the whole minimal lesion study.

One of the most interesting phases of the project is the investigation of nontuberculous pulmonary calcification, which has led to a study of certain fungus diseases, such as histoplasmosis. The first results were announced by Dr. Carroll Palmer of the Division on May 11, 1945. It was demonstrated that a mild sub-clinical condition, associated with sensitivity to histoplasmin, is responsible for much of the pulmonary calcification observed in negative reactors to tuberculin.

In Kansas City, where nontuberculous calcification is prevalent, the Division established a field station to further the epidemiology of histoplasmosis and to study its relation to other diseases. Approximately 15,000 school children and 5,000 adults in the Kansas City area have been x-rayed and tested with tuberculin and fungus antigens. During the past year, a number of reports on the work of the field station have been published, such as "Histoplasmin Sensitivity among Siblings" by Ferebee and Furcolow, and "Studies of Fungus Antigens" by Arden Howell.

Of the several reports, Dr. Howell's has perhaps the widest significance, since it offers a solution to the singular problem of cross-reactions to the fungus skin-tests. The study demonstrates that the percentage and size of cross-reactions between histoplasmin and blastomycin in animals experimentally infected with *Histoplasma capsulatum* and *Blastomyces dermatitidis* are dependent upon the dosage of the antigens employed. If the critical titers are determined and these concentrations are used in the testing, the degree of cross-reaction is small. Dr. Howell concludes that histoplasmin and blastomycin are relatively specific for guinea pigs experimentally infected with the homologous fungi.

Another interesting phase of the field station work is a co-operative investigation with Childrens Mercy Hospital in Kansas City. As part of a program to examine all admissions, nearly 400 children have been skin-tested with histoplasmin and tuberculin; and plans have been made to examine pathological autopsy material from patients whose ante-mortem skin reactions are known. Most of the hospital admissions are x-rayed, and the readings are recorded on a card that carries the skin-test data. When autopsy is performed on histoplasmin-positive subjects, the lungs are x-rayed post-mortem, and any lesions found are studied histologically and cultured for tubercle bacilli and fungi. Similar cooperative arrangements have been established with St. Luke's Hospital, General Hospital, and the University of Kansas Hospital.

During 1946 one radiologist of the Division read more than 100,000 x-ray films of the chest, in connection with the Nurses Study and Kansas City field station activities. Clinical follow-up work is progressing among children, industrial workers, student nurses, and others tested who show evidence of pulmonary disease.

The Division has also participated actively in the search for an antibiotic effective against tuberculosis. In cooperative studies with the Rockefeller Institute for Medical Research, Dr. Alfred Marshak of the Division isolated a harmless plant substance that appears to retard the development of tuberculosis in guinea pigs. The first results of his work appeared early this year (1947 - Ed.) in *Public Health Reports*, under the title "A Crystalline Antibacterial Substance from the Lichen *Ramalina Reticulata*."

It would take a great deal of time to describe Dr. Marshak's experiments in detail; but I believe you would be interested in hearing of his principal findings, and of his reasons for investigating this particular plant. He observed that *Ramalina reticulata*, commonly known as California Spanish moss, has no integument and contains a very moisture-absorbing carbohydrate. From this, the invasion and growth of bacteria would seem possible; and when Dr. Marshak isolated the carbohydrate material, he found it an excellent culture medium. But the relative absence of bacterial growth in the normal plant suggested the presence of an antibiotic substance, which Dr. Marshak isolated in crystalline form.

Before the guinea pig trials, *in vitro* tests had shown that the growth of human tubercle bacilli was completely inhibited by the crystals in concentrations of 1 to 50 thousand, and that inhibition was noticeable in concentrations as low as 1 to 2 million. The growth of avian strains *in vitro* was partly inhibited, and the growth of a bovine strain, completely inhibited. In experiments on guinea pigs infected with human tubercle bacilli, there were twice as many deaths among the controls as among the treated group. The crystals can be administered subcutaneously in oil, daily for three weeks, at a rate of 10 to 20 milligrams per guinea pig, without obvious toxic effect.

In association with interested agencies, the Division has planned to secure a sufficient amount of the crystalline material to permit thorough testing.

A comprehensive discussion of antibiotics against tuberculosis must of course include mention of streptomycin. Since 1944, when Waksman isolated crude concentrates of the substance from the soil micro-organisms *Actinomyces griseus*, streptomycin has been the current drug of promise. We are all awaiting the decisive results of streptomycin treatment of tuberculosis in human beings.

As you know, extensive controlled experiments have yet to be undertaken; but results to date not only give hope of suppressive action, even in meningitis and miliary tuberculosis, but also point the way to further investigation.

In April of this year (1947), the Public Health Service issued a memorandum to all medical officers in charge of Marine Hospitals, authorizing the cautious use of streptomycin for certain tuberculous diseases. Those listed were tuberculosis of the larynx, trachea, and bronchi; tuberculosis of the skin; draining tuberculous sinuses; tuberculous meningitis; miliary tuberculosis; and clinically active pulmonary tuberculosis, when not too far advanced and when not responsive to bed rest or collapse therapy. Medical officers were further requested to limit the use of streptomycin in pulmonary tuberculosis to progressive cases and to those that do not have extensive involvement of the lungs.

The memorandum continued with these statements:

If you use streptomycin in pulmonary tuberculosis, you should be prepared to examine cultures of tubercle bacilli for streptomycin sensitivity at regular intervals. There is no point in continuing treatment when tubercle bacilli have developed resistance to streptomycin.

Remember also that the usual period of treatment recommended is three to four months, the dosage one to three grams per day. Do not start treatment on a case unless you have adequate amounts of streptomycin for the entire treatment period.

In renal tuberculosis, streptomycin has shown no evidence of permanent benefit, although some investigators report some symptomatic relief. Accordingly, its use in renal tuberculosis is not recommended at this time.

The memorandum concluded with a warning:

Bear in mind that streptomycin treatment is not without complications. Deafness, vestibular disturbance, dermatitis, fever, nausea, and vomiting are not uncommon.

These statements reflect the present policy of the Public Health Service with regard to the streptomycin treatment of tuberculosis.

One important research project remains to be discussed: the study of BCG vaccination. On September 7, 1946, a conference was held in the offices of the Public Health Service, with representatives of seven States, Denmark, and China. Guided by recommendations from this conference, the Tuberculosis Control Division will extend its research program to include studies on the effectiveness of BCG vaccine in preventing tuberculosis. I should like, now, to review briefly the history of BCG, and to present the recommendations in general terms. This will serve to introduce a description of the present BCG studies of the Division, including the vaccination program now in progress in Columbus, Georgia.

You may recall that the literature on BCG usually mentions Dixon as the first to attempt immunization with living tubercle bacilli. In 1889 Dixon inoculated experimental animals with an old culture containing club-shaped and branching forms of the organism. A few years later, Trudeau found that the resistance of rabbits to infection was increased by subcutaneous injections of tubercle bacilli of the avian type; and still later, Von Behring immunized calves with human tubercle bacilli, or "bovo-vaccine." Von Behring's method was abandoned when the organisms were later found in the milk. In 1911 Webb and Williams showed that the resistance of guinea pigs could be augmented with minute doses of living tubercle bacilli, beginning with one organism and gradually increasing the dosage; and a few children were vaccinated in this way with apparent success.

Then, in 1924, the French bacteriologist Calmette advocated inoculation with bovine bacilli attenuated by cultivation on bile-potato medium for 15 years. The vaccine, *Bacillus Calmette-Guérin*, was acclaimed in countries of eastern Europe and South America, where French influence was strong. In Great Britain and the United States, however, it was either ignored or opposed, for the most part, until impartial investigations were undertaken about eight years ago; and only today can it be said that we fully appreciate the possibilities of BCG.

The United States Public Health Service and the Office of Indian Affairs, Department of the Interior, began an investigation of BCG in December 1935. The vaccine was to be used in an attempt to reduce the high incidence of tuberculosis among North American Indians. Since there was uncertainty at that time as to the validity of many reports on the subject, it was decided to conduct a controlled study, rather than an uncontrolled broad-scale program of vaccination. The study group comprised 3,007 persons, aged 1 to 20 years, who were selected on the basis of a negative tuberculin reaction. BCG was given intracutaneously to 1,550, with 1,457 serving as controls; and the group was followed for six years with annual tuberculin tests and chest x-ray examination.

During the six-year period, 60 deaths from all causes occurred among the 1,457 children in the control group, and 34 among the 1,550 vaccinated. There were 28 deaths from tuberculosis among the controls, and only four such deaths among the vaccinated group. In short, the results indicated that a high degree of protection was afforded by the vaccine.

The success of the study among Indians urged that the possibilities of BCG vaccination be thoroughly explored, especially among population groups highly exposed to tuberculosis. Accord-



ingly, the conference was held last fall by the Tuberculosis Control Division to consider the use of BCG among such groups, and to make recommendations for further investigation. It was strongly advocated that the vaccine should not be produced commercially as yet, since information is incomplete as to the amount or duration of conferred resistance. But on the basis of all published reports and the experience of members of the conference who had actually performed vaccination, it was agreed that no proved cases of progressive disease among human beings can be attributed to the vaccine. Further research should be undertaken, however, in an effort to reduce the number of severe local reactions.

It was recommended that a single laboratory be established by the Tuberculosis Control Division to produce the vaccine for use in research programs, and that extensive investigations be conducted in cooperation with recognized research groups throughout the country. Research was strongly recommended to measure the efficiency of BCG; to develop a vaccine composed of dead bacilli; and to simplify the vaccination technique. It was suggested that the Public Health Service undertake a controlled study in a community with a population of 100,000 or more, to determine immediate and long-range results. Another objective must be the development of standardized methods for preparing a potent and stable vaccine for use in the United States and, if possible, throughout the world.

And now I should like to say a few words on the controlled program of BCG vaccination among school children, begun recently by the Tuberculosis Control Division in Columbus and Muscogee County, Georgia. As a first step, the parents were asked to sign "consent" cards, which set forth the general procedure and purpose of the inoculations. The children whose parents approved were then tested with tuberculin, and only those whose tests showed no tuberculous infection were vaccinated. Three Public Health Service teams, each composed of a doctor, nurse, and clerk, administered the tests and then the vaccine. To reduce the number of severe local reactions, Rosenthal's multiple-puncture method was used, and with a high degree of success—though I should mention that the time required to vaccinate and the objections of the children to the 30 successive punctures occasioned some difficulty. The problem of sterilization precluded the use of devices for simultaneous inoculation. Dr. Johannes Holm of Denmark provided the PPD, and Dr. Rosenthal, who was present in Columbus as a consultant, furnished the BCG.

It will be several years, of course, before the effectiveness of the vaccinations can be accurately determined; but we can say now that the study to date has been very successful. We attribute

this success, mainly, to the earnest cooperation of the city and county school boards, PTA's, the county medical society, and the State and local health departments. The work in Columbus is the first step in a program of research that will be extended to other cities.

These are a few of the activities and achievements of the Tuberculosis Control Division of the Public Health Service. They appear to reflect the progress of the entire control movement in the United States. All agencies engaged in that movement must have as their primary function the planning of a decisive and concentrated attack to attain four objectives: First, the discovery of every person in the country infected with tuberculosis. Second, isolation and medical care for every patient needing treatment. Third, after-care and rehabilitation. And fourth, protection of the afflicted family against economic distress. The objectives of the Division, and to some extent the methods for their attainment, are in reality common to all who seek the eradication of this disease.

In State and local tuberculosis control work, guidance is the principal role of the Division. It is our practice to withdraw from active participation in a State program as soon as adequate control measures are established, and to serve mainly through financial aid and research. Today, I have tried to show, by a few examples, how the Division provides direct service, and I believe I have covered our most significant research projects.

Although reported figures show that tuberculosis mortality is on the decline, we are all aware that many grave problems confront us in the fight against the disease. The Tuberculosis Control Division is dedicated to assist all interested persons and agencies in solving those problems. It will continue to conduct research, and to provide aid to States through financial grants, training, and direct service to communities. As the States develop smoothly operating programs, the target of the Federal attack will change, until every State and community is prepared to war effectively against tuberculosis.

#### SUMMARY

During the past year material progress has been made in the several phases of tuberculosis control. Case-finding through mass radiography has been substantially extended. Controlled research on the efficacy of B.C.G. vaccine as a preventive measure has been initiated. The Tuberculosis Control Division has continued the study of histoplasmin sensitivity among nurses. The search for an antibiotic which will be effective against the tubercle bacilli continues with great promise for the future. Results of the use of

streptomycin in miliary tuberculosis, cutaneous fistulae, and tuberculous meningitis are encouraging, with preliminary studies indicating promising results in pulmonary tuberculosis. A crystalline substance has been isolated from California Spanish Moss which appears to retard the progress of tuberculosis in guinea pigs.

By direct services rendered through demonstrations and the loan of personnel, the Division has continued its policy of aid to States and local communities.

#### RESUMEN

Durante el año pasado se han llevado a cabo adelantos importantes en las varias fases del control de la tuberculosis. Se han extendido substancialmente el descubrimiento de casos mediante la radiografía colectiva. Se ha iniciado la investigación comprobada sobre la eficacia de la vacuna con B.C.G. como medida profiláctica. La División para el Control de la Tuberculosis ha continuado el estudio de la sensibilidad a la histoplasmina entre las enfermeras. La búsqueda para encontrar un antibiótico que sea eficaz contra los bacilos tuberculosos continúa con un futuro prometedor. Son alentadores los resultados del uso de la estreptomicina en la tuberculosis miliar, las fistulas cutáneas y la meningitis tuberculosa, y los estudios preliminares indican resultados prometedores en la tuberculosis pulmonar. Se ha extraído una substancia cristalina del Musgo Español Californiano, la que parece retardar el avance de la tuberculosis en los cobayos.

Mediante servicios directos, que han incluido demostraciones y préstamos de personal, ha continuado la División en su plan de ayudar a los Estados y a las colectividades locales.

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## Experiences in Air Transportation of Patients with War Wounds of the Chest\*

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During the early days of the Pacific war and the battle for the Solomons the first mass air evacuation of casualties was attempted by U. S. Marine Corps Transports. During a period of five months an estimated 12,000 casualties were flown to hospitals five hours distant. Quoting from an article by Flaherty, T. T., Yavorsky, Wm. O., Yood, N. L. and McWilliams, Jos. G., published in the July 1943 issue of the Naval Medical Bulletin, the following comments concerning air transport of chest wounds are worth noting:

"Many chest wounds have been evacuated by air. In most instances the specific type of injury is not known by the flight surgeon on the plane. On the whole, only moderate dyspnea has been encountered below 400 feet. Oxygen has been used only with dyspnea and not prophylactically. With chest cases flights have been made at altitudes below 1000 feet unless weather conditions demanded higher altitudes for safety of the ship."

In this discussion one death was reported in a patient with a left hemothorax flown at an altitude of 4000 feet for two hours. Sudden dyspnea and collapse occurred which was found on autopsy to be due to further intrathoracic hemorrhage occurring in flight. An attempt to give plasma failed, aboard the plane, due to collapse of the veins.

From another article by McMahon, Alphonse, and Huston, H. R., in the November issue of the same periodical entitled, "War Wounds of the Chest," I extract the following:

(a) Two hundred seventy-eight cases of war wounds of the chest were encountered at a U. S. N. Base Hospital in the South Pacific.

(b) Of the total number 81 were classed as perforating wounds of the chest with primary manifestations in the pleural cavity as pneumothorax, hemothorax, hemopneumothorax; or the secondary evidence of empyema and pleural effusion. Eighteen of these were complicated by multiple wounds elsewhere in the body. Six of the 81 cases succumbed to the injury. Inasmuch as this hospital, not named in the article, was the first base hospital south of the Solomons and received nearly all of its patients by air

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during the early months of the Solomons campaign, it may be assumed that nearly all of the total of 278 cases were flown in.

In January 1944, the writer was sent out into the Pacific Theatre to organize and to direct a medical group to be engaged in evacuation of non-effective sick and wounded by air transport. During the battles for Iwo Jima and Okinawa approximately 15,000 battle injuries, and non-effective sick were flown from these two target areas to Naval and Army hospitals in the Mariannas. Among the patients carried by Air Transport were injuries of every description, which involved all portions of the body, and followed the usual percentage distribution of battle wounds in this war, with wounds of the extremities occurring with greatest frequency, followed by wounds of the abdomen and torso and head and neck in decreasing frequency. In the fiercely contested battle for the heavily Jap garrisoned island area of Iwo Jima and the Okinawa groups, the one thing which could be said characterizing battle wounds was that all of them were of more than usual severity.

The causative agents were, quite typically: first in frequency, fragments from mortar and hand grenades, followed by rifle and machine gun projectiles, the heavy mortar and shell missiles, and finally, bayonet wounds. Enemy sharpshooters were numerous, well dug in, and perfectly camouflaged, so that the percentage of wounds caused by rifle fire was higher than in almost any other battles of the Pacific, and accounts for a higher than normal incidence of wounds of head and neck and upper or (exposed) parts of the chest.

During the Iwo campaign one squadron of Navy R4D Transports and one of Navy's PBM (sea planes) were employed as Task Group 94.12, responsible for air evacuation. The medical staff then consisted of five medical officers, three Hospital Corps officers, twenty-four flight nurses and twenty-four Hospital Corps men. One medical officer (F.S.) and three hospital corps assistants were dispatched to the target area to set up a screening and loading unit. This unit had the responsibility for receiving casualties from the Casualty Air Evacuation Hospital near the Air Field, reviewing of casualty tags and medical records, and issuance of instructions for the care of each patient while enroute by air to the Mariannas. Flight nurses and hospital corpsmen were to see all cases with him before embarkation, and were instructed as to any expected or possible emergencies. Any routine medications were to be continued in flight. These consisted of administration of sulfa drugs, penicillin, plasma, serum albumen, whole blood, oxygen inhalation, sedatives, etc.

After conclusion of the Iwo Jima operation the total responsibility for air evacuation of non-effective sick personnel and battle

casualties, Pacific areas, was assumed as a function of Naval Air Transport, Pacific Wing, for the Navy, and Air Evacuation Group One was set up at Guam. The administrative details of this organization are not described in this article because of later reorganization. Air Evacuation Group One included the following medical components: "One Captain, MC, USN, as staff medical officer; Six flight surgeons, ranking from Lieutenant to Lieutenant Commander, USN and USNR; Four Hospital Corps officers of the rank of Lieutenant or Lieutenant (junior grade); Eighty-five flight nurses, five of whom had the rank of chief nurse; One hundred and fifty-six flight hospital corpsmen."

Air Evacuation Group One was supplied with Douglas Sky-masters, long-range, four-engined transports similar to those employed by the Air Transport Command and Naval Air Transport Service for long distance cargo and passenger hauling. Those assigned to the air evacuation schedules were equipped with webbing strap litter supports for twenty-eight litter borne patients. Additional seats for four ambulatory patients were also provided. In addition to the regular crew, a flight nurse and a flight hospital corpsman accompanied each trip. Medical equipment and supplies comprised the following items:

(a) One air-borne medical chest, weighing about 70 pounds, containing dressings, instruments, medicines, bed pans, urinals, catheters, etc.

(b) One refrigerated whole blood chest, containing two units each of whole blood, plasma, albumen, and a supply of distilled water and penicillin.

(c) Boxed aviation flight rations were placed aboard each plane just before departure for the target, and consisted of canned fruit juices, soups, and bouillons, crackers, tomato juice, tinned boned chicken, turkey, and tuna, candy, chewing gum, cigarettes and other miscellany. In addition, a carton containing loaves of bread, paper cups, and feeding tubes or bent straws was added. Thermos jugs containing hot coffee and cold water were carried. The fresh water tanks of the plane also were filled before each trip. Two electric hot cups at 12-24 volts were carried in the medical chest.

(d) Twenty-eight steel-poled or aluminum-poled litters were carried, as well as three blankets per patient. These were off-loaded at the target in exchange for loaded litters, and blankets.

After a 1,500 mile return trip of about 7½ hours duration, the patients were disembarked at the Naval Air Evacuation Center at Agana Field, Guam. The unloading was quickly accomplished by roll-a-way step ladder, followed by the unloading of litter cases by roll-a-way two stage loading platform or by finger-lift truck.

All types of injuries were accepted and transported. Only one patient from Iwo Jima and only two from Okinawa died during the trips by plane. In none of these was it considered that conditions peculiar to air travel were responsible for the fatal termination. In the beginning of our operations the screening officer at the target accepted no early chest wounds and only those abdominal wounds which had been successfully operated upon and were well stabilized postoperative cases. During periods of intensive battle with overloads of casualties, it became necessary to transport casualties only a few hours after being wounded. The only criterion used in screening at such intervals was this question: "Is this patient in condition to survive transportation by any means, land, sea, or air?" Patients with continued hemorrhage; in shock; or badly exsanguinated were held for treatment by shock team before being sent out.

Chest penetrating wounds were accepted if there was no marked dyspnea and the patient was reasonably comfortable. Pilots were advised when carrying such loads of casualties not to exceed 2000 feet altitude and flight medical attendants were told to employ oxygen if dyspnea or signs of anoxia developed. One of the two patients who died had a bullet wound through the base of the skull and after ten days in the hospital on Okinawa was sent over for air evacuation suffering from an unrecognized bilateral bronchopneumonia. This patient arrived at Guam in a moribund condition and expired three hours later in Fleet Hospital No. 111. Necropsy disclosed the pneumonia and a basilar brain abscess.

As was intimated earlier in this paper, certain criteria were set up during the first days of our operations. Perforating wounds of the abdomen were not considered good risks for air travel until at least eight to ten days after operation. Penetrating wounds of the chest, with complicating hemorrhage or pneumothorax, and mediastinal injuries were (upon the advice of several early writers on the subject), considered as not suitable cases for air travel. Then, suddenly we were called upon to meet military necessities as they occurred. We were frequently confronted with the choice of moving such patients to the hospitals 1500 miles away, where the best of equipment and skill awaited, or of leaving them to be carted back miles to already overloaded medical facilities not too far behind the line of battle. There was no real choice. We adopted the relatively simple criterion of asking ourselves, "Is this patient capable of being moved by any of the available means of transportation with a fair chance of surviving the trip?" So we began moving recent chest injuries, abdominal injuries, compound fractures, often supported only by temporary splint-

ings, and burned cases, out of the battle area and to the hospital 1500 miles away, and we found that they not only survived the trip but frequently arrived in the Mariannas in better condition than when we first examined them in Okinawa and in Iwo Jima. Out of perhaps 500 chest injuries of all grades of severity and with all of the usual complications, not *one* died enroute, and I do not believe that the 7½ hours of air travel seriously affected the eventual prognosis of any of them.

#### *Physiological Considerations Imposed in Flight*

There are several things which were overlooked by the excellent physiologists, internists, surgeons, and chest men, who had predicted dire results if certain categories of injuries were transported by air. Allow me to explain a few of the overlooked factors:

1. First, it was not foreseen that in flying for great distances over open seas, in certain ocean areas and in most seasons of the year there are no violent storm areas which *must be flown through*. Consequently our flights could be set up for either 6000 feet or at 2000 feet, above or below the usual levels of slight turbulence. Several plane loads of most critical cases from Iwo Jima were flown the entire distance back to Guam at 600 to 800 feet. Altitudes up to 2000 feet do not produce anoxia through lowering of the partial oxygen pressure of inspired atmospheric air. It should be explained at this point that air transport of chest injuries over land does not permit of maintaining a constant altitude of 2000 to 3000 feet due to the nature of the terrain. Natural obstructions, such as mountain ranges and high plateaus require altitudes of 8000 to 12000 feet for crossing. No measurable degree of physiological oxygen want has been demonstrated at altitudes up to 5000 feet although there may be some slight effect. Oxygen breathing equipment for aircraft use is set so that the partial pressure of O<sub>2</sub> supplied shall not be reduced at any time below the 5000 foot altitude equivalent. Reduction in absolute atmospheric pressure, too, at the scheduled flight altitudes in the Pacific could not exert any considerable change in volume or pressure of any entrapped gases in lung spaces or in the intestines. Thus all of the physiological objections to moving patients in these categories by aircraft were at once obviated by the selection of lower altitudes for return flights of air transports carrying such cases. These objections certainly would have to be considered, however, in any overland transfer of such cases.

In the summer and fall of 1945 a great many patients were flown back to the States and to Pearl Harbor from Naval Hospitals in the Philippines and from the Admiralty Islands. The question was raised as to possibility of air evacuation of tubercu-



losis cases. The answer was as in previous instances—yes, these cases can be transferred by plane, subject to the following exceptions: (a) Pneumothorax was not to be performed within seventy-two hours prior to the flight, and (b) cases with demonstrable cavitation or prone to hemorrhage were not to be accepted. Pilots were advised to use minimum safe altitude and plane loads of these patients went through at 2500 to 3000 feet altitude. No untoward reactions were observed except that these patients occasionally showed cyanosis and dyspnea even at relatively low flight altitudes. When oxygen was administered the cyanosis and dyspnea disappeared. It would appear on the basis of this experience that cases of pulmonary tuberculosis without cavitation and not too recently relaxed by artificial pneumothorax may be safely transported by air at altitudes not exceeding 3000 feet. Medical attendants should accompany such cases in the event of rapidly developing cyanosis or dyspnea. Oxygen, of course, should always be available. Sedation was almost routinely employed by Naval Hospitals in the Philippines in preparation for the trip.

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## Discussion

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The transport by aircraft of large numbers of injured and sick personnel during the recent war arose out of military necessity. The war throughout was one in which our military forces were committed to attacking and defeating an enemy already in possession of large or small land areas, which, in most instances,

he was well prepared to defend. Our repeated invasions over beach-heads held by our enemies necessitated the development of an entirely new method of attack combining air, sea and ground forces, which became known as amphibious warfare.

Amphibious warfare, or attack on enemy shores from the sea, presupposes or requires the following conditions: (1) That our naval forces can maintain control against enemy naval forces of the sea lanes of approach. (2) Combined naval, air and ground force coordination in attacking enemy shores and in sufficient force so that beach-heads can be held against any possible enemy attack during the subsequent movement of men, munitions and supplies into the area. (3) Heavy casualties must be expected which must be moved quickly and in large numbers from the beach-head over considerable distances back to the supporting bases where our attacking forces have been concentrated and where adequate facilities for their medical and surgical care have been prepared prior to the final movement forward. Such movement of casualties must be accomplished by hospital ships, hospital transport vessels, and large transport type aircraft properly modified and equipped for such employment and manned by well trained medical and hospital corps personnel.

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## Eradicating Tuberculosis in Rural Minnesota\*

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The accomplishments of the Veterinarians in eradication of tuberculosis among cattle by the use of the tuberculin test were so inspiring that it was decided in 1930 to institute a similar, but modified program for the people in the Riverside Sanatorium district of Minnesota.

The 3800 square miles which comprise this district are located in the south central and western part of the State and include four large counties: Chippewa, Lac Qui Parle, Renville and Yellow Medicine. There are twenty-seven small cities and towns, and approximately 265 rural schools in the district. The tuberculosis control work had the following aims:

- 1) Find the infected children, so they could be observed throughout their school career and on into adulthood.
- 2) Seek the source of infection for each child who reacted to tuberculin.
- 3) Eliminate the infective factor, by breaking the contact with the child preferably by institutionalizing the contagious persons or otherwise controlling their disease.
- 4) Examine all adult contacts of the children in the schools including teachers, janitors, bus drivers, cooks, office help, etc.
- 5) Institute an educational program including talks, motion picture films, literature, etc., to reach all lay groups and civic organizations.
- 6) Institute a follow-up program, checking each tuberculin reactor by x-ray films of the chest at least once each two years, or more often if indicated.
- 7) Obtain 100 per cent cooperation from the State and local medical societies.
- 8) Aid the veterinarians' program of eradication of tuberculosis among animals, particularly cattle, so no human would be infected with the bovine type of tubercle bacillus.

An intensive educational program was begun to gain the cooperation of school boards, lay organizations such as Rotary, Kiwanis, Lions, Commercial Clubs, American Legion, Parent Teachers organizations, Farm Bureau groups, etc. With the backing of these organizations and a ruling by our Attorney General, Harry H. Peterson, "that the mantoux skin test for teachers and other school employees is a reasonable exercise of police powers of the

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school boards, if required for the purpose of safeguarding the health of the pupils of public schools;" our Tuberculin Testing surveys were instituted.

School boards could legally require all employees, including teachers, to prove themselves safe to act as guardians of our children during the school hours. Each child was given a blank consent form to be signed by the parent or guardian for the administration of the Mantoux test and, if a reaction occurred, x-ray film inspection of the chest. No test was given without written permission. At the same time it was explained that it would be necessary to x-ray all reactors, and that if the individual was able to pay a fee, \$1.00 would be charged to partially cover the cost of the film. The additional cost of the entire examination was derived from Christmas Seal money. For persons unable to pay, the entire expense was borne by this fund. All reactors were x-rayed regardless of their ability to pay. Care was taken to explain that the \$1.00 did not cover the cost of the work and materials, and that the balance was provided by Christmas Seal money and the Sanatorium.

Our goal was high even in the early days of the program. We established the rule that the children of no school would be tested unless consent blanks were returned by a minimum of 80 per cent of the pupils. This placed the responsibility for the testing program on each community where the work was to be done. Parent-teacher groups worked hard to obtain the 80 per cent consents. A spirit of rivalry developed between various towns and schools which practically always assured the success of the program. Every effort was made to retest the schools each two years. Saranac Lake Old Tuberculin 1/1000 strength was used in all our tests. Comparisons of this and PPD were used on certain occasions during the years, as were readings at 48-72 and 96 hour intervals. It was found that a 72 hour reading is more accurate than the 48 hour intervals, owing to the fact that it detects some of the so-called "delayed reactions," as well as eliminates the possibility of interpreting small areas of erythema due to trauma, etc., as tuberculin reactions.

In every instance diligent search was made to determine where the reactors received the infection. Here our field nurse and the knowledge of the family physicians proved of great value. In many instances the source of infection was found in a grandparent, an uncle, an aunt, hired man, etc., who had unsuspected or undiagnosed infectious tuberculosis. During the first several years of this program we found twelve teachers with demonstrable tuberculosis, of whom eight had positive sputum. In one of our larger schools 42.6 per cent of the pupils in one room reacted



to the Mantoux Test. The teacher also reacted and the x-ray films of the chest revealed evidence of disease which was proved to represent Far Advance "C" pulmonary tuberculosis. This teacher died in a sanatorium within sixty days of discovery. Of the pupils who reacted to tuberculin in this teachers' room, two developed demonstrable active pulmonary tuberculosis within a year.

All teachers and school employees found to have contagious tuberculosis were removed from contact with the children. This work went on yearly with pleasing results. Over 50,000 children were tested and the percentage of tuberculin reactors found in the same schools decreased as the years passed.

The following table shows the decrease in the percentage of tuberculin reactors in some of our schools observed during the years of the surveys:

	Year	Percentage Reactors
Clara City . . . . .	1935 . . . . .	11.6
	1946 . . . . .	0
Clara City (Parochial) . . . . .	1934 . . . . .	30.5
	1946 . . . . .	0
Boyd . . . . .	1931 . . . . .	15.6
	1946 . . . . .	0
Bird Island (Parochial) . . . . .	1931 . . . . .	25.7
	1947 . . . . .	2.2
Bellingham . . . . .	1935 . . . . .	7.5
	1946 . . . . .	0
Fairfax (Parochial) . . . . .	1934 . . . . .	6.9
	1946 . . . . .	0
Milan . . . . .	1930 . . . . .	18.6
	1946 . . . . .	0
Olivia (Parochial) . . . . .	1934 . . . . .	14.4
	1946 . . . . .	2.7
Rosen . . . . .	1934 . . . . .	8.8
	1946 . . . . .	0
Nassau . . . . .	1937 . . . . .	8.8
	1946 . . . . .	0
Madison (Parochial) . . . . .	1934 . . . . .	8.1
	1946 . . . . .	0
Echo . . . . .	1931 . . . . .	10.8
	1946 . . . . .	2.6
Montevideo . . . . .	1934 . . . . .	13.6
	1946 . . . . .	3.4
Marietta . . . . .	1931 . . . . .	17.9
	1946 . . . . .	3.4
Olivia . . . . .	1934 . . . . .	11.5
	1946 . . . . .	4.1
Hanley Falls . . . . .	1932 . . . . .	11.7
	1946 . . . . .	1.3
Boyd . . . . .	1931 . . . . .	15.6
	1946 . . . . .	1.8

	Year	Percentage Reactors
Fairfax . . . . .	1934 . . . . .	21.3
	1946 . . . . .	1.7
Wood Lake . . . . .	1930 . . . . .	8.6
	1946 . . . . .	1.8
Clarkfield . . . . .	1933 . . . . .	9.6
	1946 . . . . .	4.1
Morton . . . . .	1934 . . . . .	13.6
	1946 . . . . .	2.7
Sacred Heart . . . . .	1933 . . . . .	21.2
	1946 . . . . .	3.0
Franklin . . . . .	1934 . . . . .	12.2
	1946 . . . . .	3.5
Renville . . . . .	1934 . . . . .	7.4
	1946 . . . . .	4.2
Yellow Medicine County . . . . .	1935 . . . . .	8.2
Rural (84 schools) Yellow Medicine County . . . . .	1946 . . . . .	.9

The Minnesota Sub-Committee on Tuberculosis of the American School Health Association consists of such persons as Dr. E. A. Meyerding of St. Paul and Dr. S. A. Slater of Worthington, both inspiring leaders and pioneers in this work. In 1943 this Committee prepared standards by which individual schools or whole systems in Minnesota might be certified with reference to tuberculosis. In order for a school to be certified, it must meet these standards which pertain to tuberculosis control work in progress. Those meeting the highest standard were offered Class "A" certificates, while those with slightly lower qualifications received Class "B" certificates. The requirements for Class "A" certification are briefly as follows:

- 1) Testing from 95 to 100 per cent of pupils and making x-ray inspections of the chest of all reactors.
- 2) Testing 100 per cent of the school personnel and requiring x-ray film inspection of the chests of all reactors. This includes teachers, janitors, bus drivers, cooks, clerical help, etc.
- 3) Completing the examination of all who presented x-ray shadows which might be caused by tuberculous lesions.
- 4) Conducting an educational program for the staff of each school so that the principles of tuberculosis control would be understood.
- 5) All non-reactors to tuberculin to be retested each two years.
- 6) All reactors to be x-rayed each two years, unless more frequent inspections were especially indicated.

For the Class "B" certification, the requirements were exactly the same as for Class "A" except that only 80 to 95 per cent of the pupils be tested.

In January 1946, work was begun in an attempt to accredit as many schools as possible under this new program of the American School Health Association. A summary of our 1946-47 work toward accrediting all of our schools is as follows:

Number of Schools tested . . . . .	277
Number of Schools Certified . . . . .	225
Class "A" certificates awarded . . . . .	161
Class "B" certificates awarded . . . . .	64
Number of Schools 100 per cent tested . . . . .	138
Number of Schools with <i>No tuberculin Reactors</i> . . . . .	219
Number of Children tested . . . . .	12,666

The percentage of school children tested and the percentage of reactors found in each of our four counties in 1946-47 is as follows:

	Per cent Tested	Per cent Reactors
Yellow Medicine County . . . . .	91.4	3.0
Chippewa County . . . . .	90	2.2
Renville County . . . . .	86.3	3.4
Lac Qui Parle County . . . . .	90	2.3

In these same counties an average of 13.9 per cent of the children reacted to tuberculin from 1930-1934.

In making these surveys members of school personnel were tested at the same time as the children. The age range of adults tested was from 21 to 71 years. An older age average was maintained during the war period due to the lack of younger personnel in the schools, so that many of the teachers were well over 45 years old. The total number of adults tested was 3,698, of whom 801 (21.6 per cent) were reactors and 2,897 were non-reactors.

Most of our cases of pulmonary tuberculosis in the future will develop among these persons who are reactors to tuberculin today. Therefore, not only control but also eradication of tuberculosis can be accomplished by the foregoing program. It is a matter of starting at the "grass roots" to eliminate tuberculosis. In other words, begin with the child to find the infection, then discover its source. Eliminate the fountain head of tubercle bacilli, either by controlling the disease or by hospitalization. Carefully watch the infected children; make x-ray film inspection of their chests annually as they approach and continue on into adulthood. If x-ray shadows appear, complete the examination for tuberculosis. We do not make a diagnosis from x-ray shadows alone.

The weapons are now in our hands; they must be used with arduous work to eliminate tuberculosis. The main weapons are the Mantoux test, the X-ray, complete examination when shadows are found, and the field nurse. No single phase of the examination is adequate. All must be used together to conquer this scourge of mankind. In areas where there is a low incidence of tuberculosis, we feel that the tuberculin testing survey should always come first. The x-ray inspection of the chest can then be limited to the reactors, rather than a mass x-ray program. When a

tuberculin reaction is present, two important facts are immediately established:

- 1) The individual has at least primary lesions and is a potential case of clinical tuberculosis.
- 2) There has been a source of infection which may be sought and often found among the individual's adult contacts in daily life.

The simple fact that a person reacts to tuberculin immediately arouses an intense interest in tuberculosis and a desire for information concerning the ultimate outcome of this infection. The logic of periodic examinations, including x-ray film inspection of the chest, appears to be obvious to them and their cooperation is easily gained. On the other hand, if only x-ray film inspection is made as is practiced in mass x-ray surveys, and the findings are reported as normal, it is often exceedingly difficult to maintain that individual's interest in subsequent periodic examinations, which may often be indicated. A tuberculin reaction gives us a definite hold on the individual and affords the knowledge that he has been infected. This knowledge alone in most cases assures us of full cooperation thereafter. To us it seems far more important to concentrate our attention on the tuberculin reactors where potential clinical tuberculosis exists, than to devote time, energy and money for the making of x-ray inspections of the much larger number in whom there is no possibility of finding clinical tuberculosis.

We believe that tuberculosis in rural Minnesota can be eradicated by this method. In fact, it has been eradicated from the children in a large number of schools. It would be a tragedy to introduce BCG in an area such as ours. To artificially establish sensitivity of the tissues of all of our citizens would be to destroy our most potent weapon: the tuberculin test. It must be remembered that in order to develop clinical tuberculosis, infection must first occur. If we eliminate the sources of infection, and carefully watch those few whose tuberculin test shows that they have been infected, we have every reason to believe that tuberculosis will be relegated to the same category as typhoid fever and small-pox in our entire state within the life span of the coming generation.

#### SUMMARY

1) An eight-point tuberculosis control program was developed in a four-county tuberculosis sanatorium district in 1930. This included measures for preventing the dissemination of tubercle bacilli of both the bovine and human types. Then 13.9 per cent of the school children reacted to tuberculin. In 1946 and 1947,



only 2.7 per cent of all the children in the same schools reacted.

2) Among the 277 schools of the district there were 219 in which no child was found to react to tuberculin in 1946 and 1947. Thus, in these areas tuberculosis has been completely eradicated at this age level.

3) Certification of schools on the basis of tuberculosis control work in progress has been found of extreme value in stimulating interest and activity of the public in all tuberculosis control measures.

4) This accomplishment has been made through the tuberculin test as the first line of attack, x-ray inspection of the chests of the reactors, tracing to the source and giving instructions by the field nurse, complete examination of all who react to tuberculin and show x-ray shadows for accurate diagnosis, and hospitalization and isolation of those found to have clinical and contagious disease. The dangers of the bovine type of tubercle bacillus to humans were not overlooked.

5) The methods here described are easily applied and thoroughly efficacious. They can be employed wherever tuberculosis workers have the will to eradicate the disease.

#### RESUMEN

1) En 1930 se puso en efecto un programa de ocho puntos para el control de la tuberculosis en un distrito sanatorial de tuberculosis compuesto de cuatro Condados. Este programa incluyó medidas para evitar la propagación de bacilos tuberculosos tanto de tipo bovino como humano. El 13.9 por ciento de los niños de escuela reaccionaban entonces a la tuberculina. En 1946 y 1947 solamente reaccionaba el 2.7 por ciento de los niños de estas mismas escuelas.

2) Entre las 277 escuelas del distrito hubo 219 en las que no se encontró ningún niño que reaccionara a la tuberculina en 1946 y 1947. De manera, pues, que en esos lugares se ha erradicado por completo la tuberculosis hasta esa edad.

3) Se ha notado que la certificación de las escuelas a base del esfuerzo empleado en el control de la tuberculosis ha sido de gran valor en estimular el interés y la actividad del público en todas las medidas para el control de la tuberculosis.

4) Se ha logrado este éxito, en primer lugar, mediante el uso de la prueba a la tuberculina, seguida después de la inspección radiográfica del pecho de los reactores, del descubrimiento de la fuente de infección y de órdenes expedidas por la enfermera de campo, de exámenes completos de todos los que reaccionan a la tuberculina y revelan sombras en la radiografía, para hacer un diagnóstico exacto y de hospitalización y aislamiento de aquellos

que se descubran con enfermedad clínica y contagiosa. No se pasaron por alto los peligros que pueden causar a los seres humanos los bacilos tuberculosos de tipo bovino.

5) Los métodos aquí descritos son de fácil aplicación y completamente eficaces y pueden ser empleados dondequiera que las personas que luchan contra la tuberculosis tengan el poder de voluntad de erradicar la enfermedad.

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## The Brompton Hospital A Centenary Review\*

CLIFFORD HOYLE, M.D., F.R.C.P.  
London, England

"People will not look forward to posterity,  
who never look backward to their ancestors."  
Edmund Burke, Reflections on the Revolution in France.

Mr. Chairman, Ladies and Gentlemen,

May I express my warmest thanks for your invitation to address this College. I have chosen the Brompton Hospital for my subject because its history will be new to most of you, even to those for whom the name is closely bound with the development of thoracic medicine in England. As the hospital is honored by your invitation it is fitting to mark the occasion in this way and to commemorate the great figures in English medicine who have served Brompton in the past. Brompton recently attained its centenary so that its history spans almost the entire period within which our present knowledge of chest disease has evolved.

At the time of Brompton's foundation England had a population of fifteen millions, of whom an eighth were herded in London and nearly sixty thousand died yearly from consumption. Disease and child labor together made the expectation of life for a workman not much more than seventeen years. The state of affairs was widely realized only through the novels of Dickens, Disraeli and Charles Kingsley, through Engel's account of the condition of the working class, and through Lyon Playfair's Report on the Health of Towns. Together these made a deep impression on the public mind, and a few years more saw the idea of humanitarianism become a living force.

One of the early signs of this was the foundation of Brompton. The occasion was commonplace: a city clerk with consumption was unable to gain admission to a general hospital. But the clerk concerned had won the bounty of a wise employer, a leading solicitor Philip Rose, who organized a public meeting to establish a special hospital. The "Morning Herald" of May 29, 1841, reported that "a highly respectable meeting was held at Hanover Square Rooms" at which a resolution was passed to found a hospital as an asylum for consumptive patients and as a means of furthering

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\*Presented at the 13th Annual Meeting of the American College of Chest Physicians, Atlantic City, June 7, 1947.

knowledge of the disease. The Queen gave her patronage, and Manor House at Chelsea was leased for twenty patients from September 1842, with an Out-Patient Department at 20 Great Marlborough Street. Patients nearby, too ill to attend, were visited

at their homes, pupils were admitted to the wards and lectures were organized. At the Second Anniversary Dinner in May 1843 Mr. Charles Dickens was a steward and proposed the toast "Prosperity to the Hospital." Unfortunately we have no record of what he said, though in a letter to Jerrold his views on the other speakers were pretty terse: "There were men there who made such speeches and expressed such sentiments as any moderately intelligent dust-man would have blushed through his cindery bloom to have thought of."

Meanwhile, Philip Rose and his friends were busy with the new hospital. A site was chosen



FIGURE 1

Plan of Brompton from "Cruchley's new plan of London improved to 1835" in "London in the Nineteenth Century" by Sir Walter Besant. Black, London, 1909.

at Brompton, a village in Kensington "remarkable for the salubrity of its air," and "surrounded entirely by nurseries and garden grounds which were among the first cultivated in this country." The ground was formerly part of the botanical garden founded in 1789 by William Curtis, a noted entomologist and author of *Flora Londinensis*. The foundation stone of the hospital was laid there by the Prince Consort on June 11, 1844, and sixty beds were in use by November 1846. A further wing was added a few years later with funds raised at a concert by Jenny Lind in Her Majesty's Theatre on Monday, July 31, 1848. Two novel features of the building were the division of wards into small rooms, and ventilation by warmed air through underground tunnels. This system, invented by Dr. Arnott, was de-



FIGURE 2

The "White Hart," Knightsbridge, 1820. From "Old and New London" by E. Walford. London.



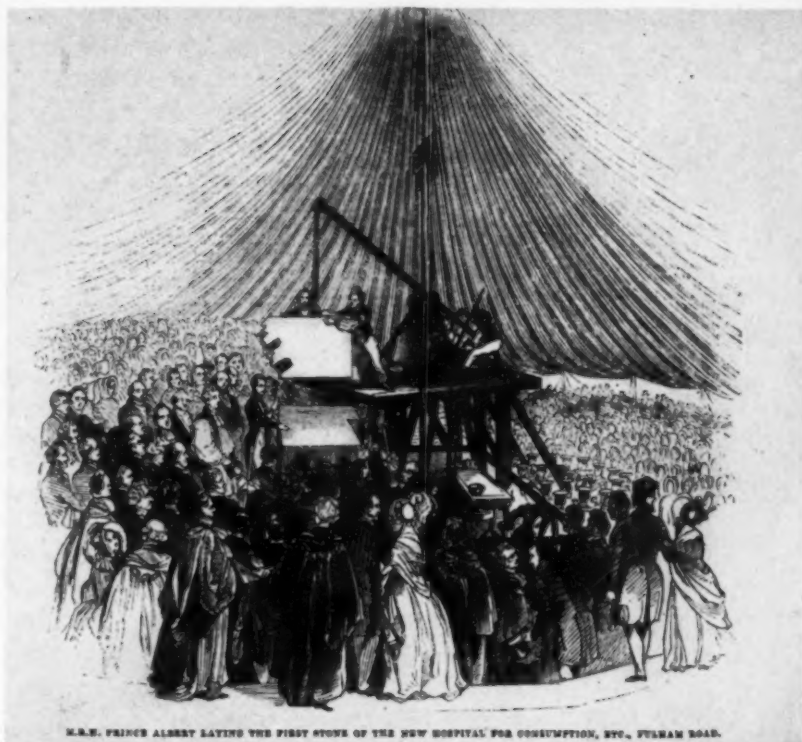


FIGURE 3: Brompton Hospital: "H. R. H. Prince Albert laying the first stone of the new hospital for consumption, etc., Fulham Road." (*The Illustrated London News*, June 15, 1844, page 388).

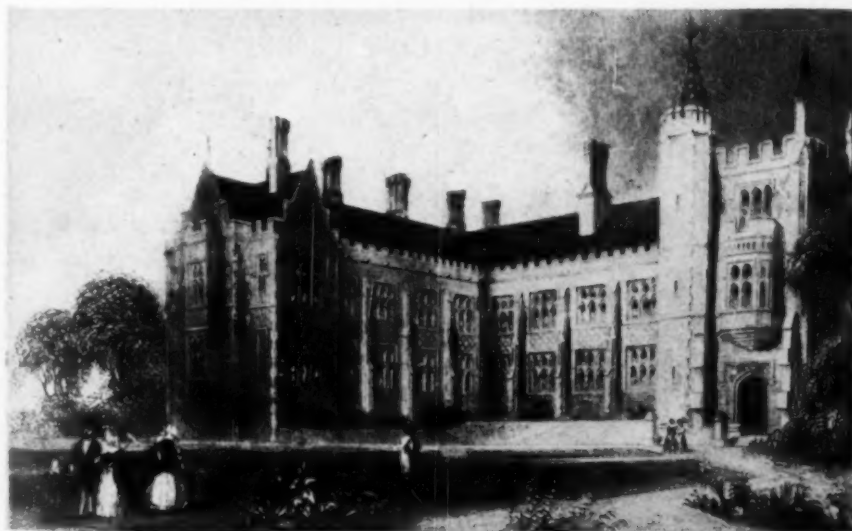


FIGURE 4: Hospital for Consumption and Diseases of the Chest (Brompton). From "*Tallis' Illustrated London*" by W. Gaspey. London, 1852.



FIGURE 5

Jenny Lind, 1849. From "The Life of Jenny Lind" by R. Maude. Cassell, London, 1926.

scribed in *The Builder* of 1847, and was used until open windows became the rule. A second large block added in 1879 with a legacy of 100,000 pounds sterling from Miss Cordelia Reed, brought the total beds to 368, besides adding other facilities. Many years later, in 1908, the International Tuberculosis Congress at Washington awarded Brompton the prize of a thousand dollars for the best hospital exhibit of the treatment of the more advanced cases of consumption.

Among the first members of the medical staff, Sir John Forbes, Walter Walshe and Robert Liston have left enduring names in British medicine. Liston was already past the zenith of his career and died in 1847. Forbes, a man of many parts, was a Scot from Banffshire who served at sea through the Napoleonic wars and

then retired to study in Edinburgh. He seems to have been a master of the art of living, for he wrote a charming book on the relation of happiness to work and knowledge, and in middle life climbed from the status of a country practitioner in Penzance to that of a prosperous consultant, a Court Physician and a Fellow of the Royal Society.

But Forbes was more than a successful man of his day. He was an eminent geologist, and the first English translator of Laennec's great work in 1821. It is altogether fitting that this fine service to thoracic medicine should have come from the man who later in life was to do much for Brompton. He translated Auenbrugger's book also, adding cases of his own to illustrate percussion; and for twelve years edited



FIGURE 6

Clairville Cottage, Brompton. First home of Jenny Lind in London. From "The Life of Jenny Lind" by R. Maude. Cassell, London, 1926.

the British and Foreign Medico-Chirurgical Review which became the leading medical journal of the day. Forbes excelled with his pen at a time when medical authors commonly wrote good prose.

Like his senior colleague, Walshe, too, had literary gifts. But he had, as well, the mind of the pioneer. Born of Irish stock in Dublin, he studied in Paris with that great inspirer of youth, Pierre Louis, whose "Phthisis" he translated for the New Sydenham Society in 1844. Here in Paris he met Oliver Wendell Holmes and the two friends kept up a correspondence until death parted them. Walshe's own writing began with a brilliant little book,



FIGURE 7: Brompton Hospital for Consumption and Diseases of the Chest; foundation stone laid on 11th of June, 1844. (Lithograph by T. G. Dutton, published by Day and Haghe).



FIGURE 8: The Consumption Hospital, Brompton. (From "Old and New London," Volume V, page 103, Cassell, London).

"The Physical Diagnosis of Diseases of the Lungs"; but his chief work was "A Practical Treatise on the Diseases of the Lungs and Heart," published in 1851. It is one of the most penetrating and best written monographs on the subject in English. He was also responsible for one of the earliest papers from Brompton, a "Report on Pulmonary Phthisis as observed at the Hospital for Consumption, Brompton," which appeared in the *British and Foreign Medico-Chirurgical Review* of 1849. Walshe had wide interests and a most observant mind. We owe to him the precise description of moveable kidney and of cephalhaematoma. He was among the earliest to recognize the presystolic character of the direct murmur of mitral stenosis; and the first to describe the contracted pupil of aortic aneurysm and to associate sudden death with an aortic reflux.

Two very differing personalities joined the medical staff in 1848, Richard Payne Cotton and Richard Quain. Cotton was then only twenty-eight, and while still a young man, four years later, wrote his book "The Nature, Symptoms and Treatment of Consumption," which has historical importance because his unorthodox opinions on many controversial matters have since become common teaching. For instance, he believed that phthisis was not occasioned by pregnancy unless there was a disposition to it, the disease



FIGURE 9



FIGURE 10

FIGURE 9: Sir John Forbes (1787-1861). (Lithograph by Maguire, 1848).  
FIGURE 10: Richard Payne Cotton (1820-1877). (From: *Leaders in Medicine and Surgery*, 1876, No. 35, Barraud and Jerrard, London).



affecting large families only when it was already rooted there, observations now explained in terms of close contact. He showed, too, that there was seldom any ill effect during gestation, the harm appearing afterwards, for which prolonged lactation was much to blame. Cotton also described phthisis in children, recognising affection of the bronchial glands as a cardinal feature, with symptoms due to bronchial compression. Nearly twenty years after the appearance of his book Cotton again showed how fresh were his powers of observation when he gave the first account of paroxysmal tachycardia.

Sir Richard Quain is memorable chiefly for his humorous personality and as an after-dinner speaker, for his part in the public side of the profession and as Lord Beaconsfield's physician. His one detailed publication, "On Fatty Diseases of the Heart," which appeared in 1850, is remarkable as an example of the ease with which important evidence can be disregarded. It is an account of 83 cases with necropsy findings. Yet so fixed was his attention upon epicardial adiposity that the ossified or obstructed coronary

arteries, found in 25 of his series, were dismissed as unimportant. Here he was in good company, for such an astute observer as William Stokes did the same.

In 1849 the first Medical Report of the Hospital gave an analysis of 4,358 consumptive patients, the largest series to be reviewed until then. Though conditions other than tuberculosis must have been included to some extent, the conclusions were accurate on many points: the age, sex and occupational incidence of the disease, for instance, and the frequency of haemoptysis. Occupation was epitomised in the brief sentence: "there are certain pursuits which... exercise a directly injurious influence on the health of those engaged in them—particularly those which compel persons to work in close, ill-ventilated and over-heated rooms"—an opinion well ahead of its time seeing that the tax



FIGURE 11

Richard Quain (1816-1898). (Cartoon by SPY, from *Vanity Fair*, Dec. 15, 1883).

on windows was not yet repealed. The Report also dealt with John Hutchinson's Spirometry—for he was, of course, the inventor, studying more than 3,000 patients at Brompton by invitation before he was appointed to the Staff in 1855.

That our ancestors had an eye for statistics was shown not only by this first Report and by a second thirteen years later, but also by the astonishing book on "The Elements of Prognosis in Consumption" by Edward Pollock which appeared in 1865. Pollock took ten years to collect his material, using 3,500 cases seen at Brompton and analyzed with the help of a statistician. Even today there is not much to add to what Pollock wrote about the natural history of consumption. We can define the forms better and we know early tuberculosis in a way quite hidden to Pollock and his time. But with these reservations his chart of the course of its various types is still reliable. He emphasized the latent character in old age, as well as in those with emphysema and rheumatic heart disease. He knew that clubbing meant very chronic disease. He showed how a good prognosis for spontaneous pneumothorax in phthisis goes with a well thickened and protective pleura, a small fistula, no effusion and a sound second lung; and he pointed out that in localized acute disease the prognosis can improve after rapid cavitation—a fact now ascribed to obstruction to the draining bronchus. As with all the literature prior to the detection of the tubercle bacillus, we allow for some confusion between tuberculous and other chronic lung infections; but the book still

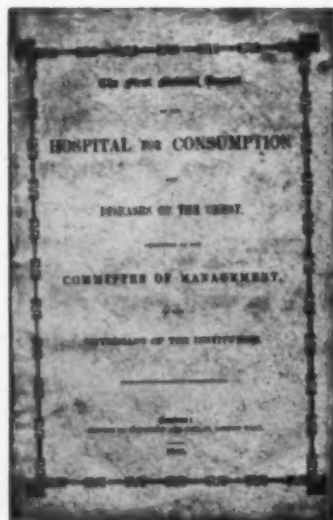


FIGURE 12

FIGURE 12: Title page of "The First Medical Report of the Hospital for Consumption and Diseases of the Chest." London, 1849.

FIGURE 13: Table VIII from "The First Medical Report."

TABLE VIII.  
Showing the Occupations of 4,358 Patients labouring under Phthisis, treated as In and Out-Patients, from September, 1842, to December 31, 1848.

MALES—Total, 2,679.				
In-Door.		Out-Door.	Mixed.	
Clerks, Warehousemen, and Shopmen ...	214	Labourers of various kinds ...	490	Carpenters ... 130
Mechanics ...	270	Coachmen and Cabmen ...	509	Painters and Glaziers ... 79
Servants ...	227	Butchers ...	15	
Tailors ...	192	Various occupations ...	184	
Shoemakers ...	157			
Printers and Compositors ...	154			
Weavers and Glovers ...	95			
Bakers ...	85			
Various ...	148			
None, or under 15 ...	231			
Total In-door ...	1,888	Total Out-door ...	798	Total Mixed ... 192
FEMALES—Total, 1,679.				
In-door.		Out-Door.	Mixed.	
Servants, or persons engaged in In-door occupations ...	896			
Milliners, Dress-makers, Needlewomen, and Sewing-machine Makers ...	312	None.	None.	
Laundresses ...	52			
Governesses ...	19			
No occupation, or under 15 ...	400			
Total In-door ...	1,679			

FIGURE 13

remains one of the classic works on its subject. There is more than one reason for regarding it as a neglected masterpiece.

The important contemporaries of Pollock at Brompton were Hutchinson, Edward Smith, William Marcet and John Burdon-Sanderson. Though they were all on the active clinical staff, it is to them that we owe the start of the experimental method as applied to respiratory function and disease—Hutchinson with spirometry; Smith with the chemistry of respiratory exchanges; Marcet with this and also his use of Villemin's discovery for diagnosing human pulmonary tuberculosis by animal inoculation with sputum; and Burdon-Sanderson in many ways. Burdon-Sanderson was incomparably the greatest, maybe of all the staff in the hundred years the most eminent for the sheer variety and extent of his original researches. They included elaborate papers on vegetable reproduction and on cattle plague; the invention of the kymograph; a fine paper on the relation between respiration and the pulse; and two fundamental studies of the excitatory process



FIGURE 14

FIGURE 14: Sir John Scott Burdon-Sanderson (1825-1905). (Cartoon by SPY from *Vanity Fair*, May 17, 1894, "Oxford Physiology").—FIGURE 15: Fig. 7 from "The Bronchi and Pulmonary Blood Vessels" by W. Ewart. London, 1889. Showing casts of the bronchial tree.



FIGURE 15

in cardiac muscle, using the capillary electrometer. Moreover, he was the first to confirm Villemin's work on the infectivity of tuberculosis for laboratory animals; investigated epidemics of cholera, cerebrospinal fever and diphtheria; made the first detailed experiments on artificial respiration in asphyxia by drowning; and did his famous studies of the syphgmograph soon after Marie's and wrote a book on them. None of his original work was directly clinical. His strength lay rather in his early grasp of the application of scientific methods to medicine, and in a superb technical skill. But, none the less, he worked for over ten years in the Out-Patient Department at Brompton, becoming one of the foremost advocates of sanatoria in their early days and of a proper system of supervision for tuberculous patients; and he spent the closing years of his life as Regius Professor of Medicine at Oxford, where he was succeeded by Osler. His position in English medicine is almost unique in that he was the first to bring the outlook of experimental physiology and to show in the profusion of his own investigations the rewards it was able to achieve. If one crucial test of a great mind is the quality of those it nurtures, Burdon-Sanderson can have few rivals; for among his associates and pupils were Sharpey, Ferrier, Waller, Mott, Rose Bradford, Osler, Victor Horsley, Romanes and Sidney Ringer.

Although Burdon-Sanderson was so eminent there must have

been something greatly lovable about him. He was notoriously absent-minded. He used to stuff one chalk duster after another into his pockets when lecturing, and then clean the blackboard with his pocket handkerchief. One evening his wife left him to conduct guests into the dining room, but found him in the hall a few minutes later helping them into their overcoats, shaking hands and saying good-night. But perhaps the most amusing reminiscence is one of which he was the victim, concerning his appointment to the Brompton staff. His rival was a staunch adherent of the Church of England. Burdon-Sanderson was therefore questioned closely on his religious principles, and

THE  
**BRONCHI AND PULMONARY  
BLOOD-VESSELS**

THEIR ANATOMY AND NOMENCLATURE:  
WITH A CRITICISM OF PROFESSOR ARVÉ'S VIEWS ON THE  
BRONCHIAL TREE OF MAMMALIA AND OF MAN

BY  
**WILLIAM EWART, M.D. CANTAB., F.R.C.P.**

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AND ASSISTANT PHYSICIAN, ROYAL FREE HOSPITAL, LONDON



LONDON  
**J. & A. CHURCHILL**

11 NEW BURLINGTON STREET

1889

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**FIGURE 16**

Title page of "The Bronchi and Pulmonary Blood Vessels" by W. Ewart. London, 1889.





FIGURE 17

FIGURE 17: William Ewart (1848-1929). Physician to St. George's Hospital.

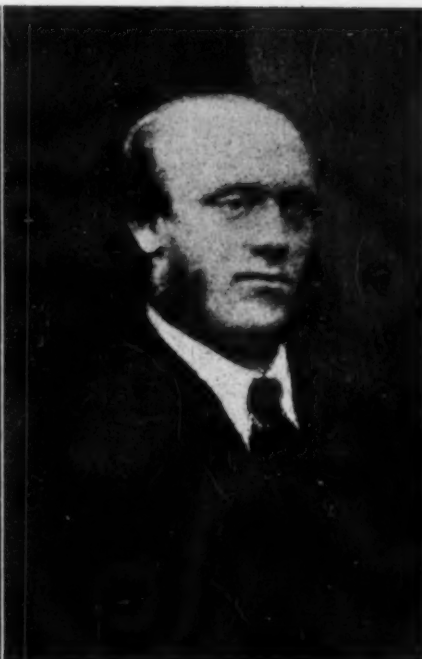


FIGURE 18

FIGURE 18: Isaac Burney Yeo (1845-1914). (From "Leaders in Medicine and Surgery, 1876." Barraud and Jerrard, London).

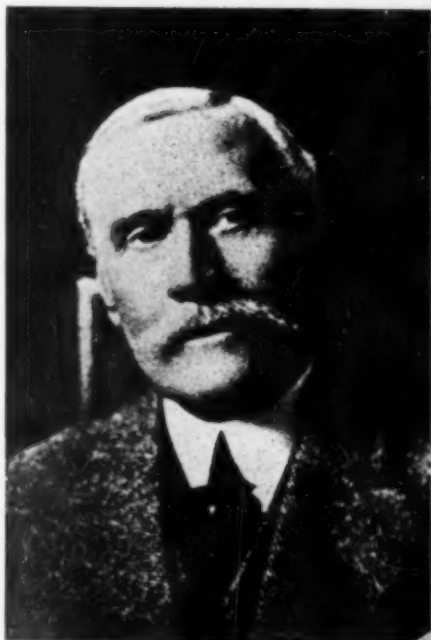


FIGURE 19

FIGURE 19: Sir James Kingston Fowler (1852-1934).

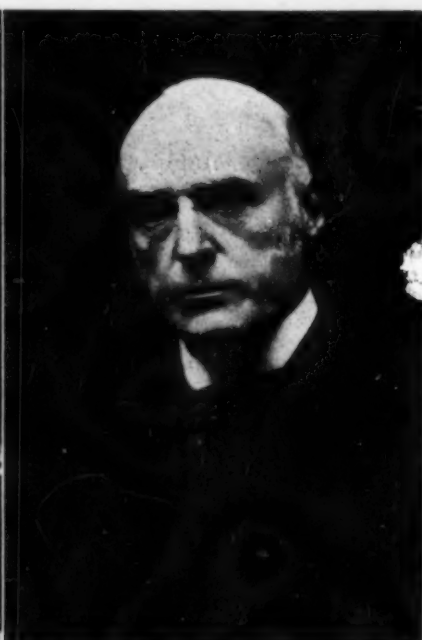


FIGURE 20

FIGURE 20: Sir Richard Douglas Powell (1842-1925).

required to get clergymen to testify to his orthodoxy before he was elected!

I have dealt at length with these early members of the Brompton staff because they planted the tree of thoracic medicine in England. True, it grew from the soil of Laennec, but they tended it wisely and well. The fruits of their work have been gathered ever since, and among those who have had the care of their legacy at Brompton were Douglas Powell, Burney Yeo, Charles Theodore Williams, Mitchell Bruce, William Ewart, Kingston Fowler, Percy Kidd, Hector Mackenzie, Sidney Martin, Batty-Shaw and L. S. T. Burrell, not to mention others in succeeding years. We cannot here do more than touch upon a few of them: William Ewart who did so much on bronchial anatomy; Burney Yeo, inventor of a simple inhalation face mask and one of the most lucid teachers of his day. How refreshing, for instance, to find the valueless use of potent remedies on hopeless cases trounced in this delightful fashion: "...if ignorant charlatans wrote in this way, we should find no language too severe to condemn their imbecility. Gentlemen, this kind of thing is foolish trifling." Kingston Fowler, too, had a pointed style and his obiter dicta are replete with gusto and clarity—such remarks as "No fool is ever cured of pulmonary tuberculosis," "Once notified, always tuberculous," and "Strange things may happen when a clinician who has 'scrapped his stethoscope' calls in a radiologist who is not a pathologist." Kingston Fowler was a fine clinician, steeped in a knowledge of morbid anatomy, full of common sense and with an intuition trained by long and patient observation at the bed-side. He and Douglas



FIGURE 21: Sanatorium for Consumption and Diseases of the Chest, Bournemouth. From "The Annual Report of the Brompton Hospital, 1853.

Powell were, by all accounts, impressive figures and fine exponents of the art of managing both patient and disease.

We have seen how Brompton already had a long record as a chest centre well before the close of last century. The next step was sanatorium development. Brehmer in 1859 and Trudeau in 1884 started sanatoria in Germany and America. Actually Brompton decided in 1851 to build a small sanatorium at Bournemouth, and it was opened in 1854. This was, in point of fact, the first sanatorium. But difficulties of travel for patients restricted its use to local cases, and, as time went by, Brompton found that another sanatorium was needed, nearer at hand. A site was chosen on the Chobham Ridges, thirty miles from London, and in June 1904 Frimley Sanatorium was opened by the Prince and Princess of Wales. It was designed for 150 patients accommodated on two stories in a stellate block, and had 65 acres of grounds.

It was a fortunate day for Frimley when Marcus Paterson was appointed the first Medical Superintendent. The work was new, the value of sanatorium treatment had still to be proven, and the lines on which that treatment should be conducted had still to be defined in detail. Paterson extended the principle of graduated exercise to include useful labor. The early trials were described in his book "Auto-Inoculation in Pulmonary Tuberculosis," and they formed the basis of the system which has been in use at Frimley ever since. Though his views on the rationale of exercise were wrong—and there lie the roots of criticism—results soon



FIGURE 22: Brompton Hospital Sanatorium, Frimley. An aerial view.

showed the value of work as an integral part of treatment. There is a story of a patient who discharged himself from the sanatorium rather than toe the line. As he left Paterson called out from his office, "Oh! by the way, tell your widow to send me a post-card."

Now we turn to more recent events. The growth of radiology completely changed assessment of the anatomical aspects of chest diseases. Blacker, the first radiologist at Brompton, was appointed in 1900; but it was the later combination of Stanley Melville and R. L. Rawlinson that brought the department to maturity. Many years ago they established the use of lateral and penetrating views of the chest, and of sinusography for the control of empyema drainage. They did much of the early work at bronchograms of high technical quality, and on the radiographic control of artificial pneumothorax and of surgical procedures. Neither Melville nor Rawlinson wrote much, and neither left an enduring monument to their work in words; but their knack of keeping close contact with the clinical staff, their insistence upon the importance of necropsy control of their findings whenever possible, and their standard of films and of interpretation were all ahead of their time for our country.

One feature at Brompton, prominent in the last twenty years, is the importance attached to careful training in breathing exercises for the restoration of functional efficiency in asthma and emphysema and after empyema drainage and other surgical procedures. Accurate techniques of postural drainage and of forced expiratory breathing and thoracic percussion were designed some years ago for treating septic bronchiectasis and some examples of lung abscess. Such treatment is essential for good results, whether as a pre-operative measure or as a routine for inoperable cases. The secrets of success are the accuracy of posturing in relation to the anatomy of the draining bronchi, and sufficiently prolonged posturing, often many hours daily at first.

But the most fruitful advances of recent times at Brompton, as in thoracic work elsewhere, have come from our surgical colleagues, whose mastery of technical problems claims the admiration of us all. There, Brompton may fairly claim that it has not only led the field in our country, but has maintained its lead with the largest and most varied thoracic surgical experience. The opening moves were due to J. E. H. Roberts and Tudor Edwards. In 1924 Tudor Edwards gave the first account in the English literature of thoracoscopic division of adhesions. By 1927 he reported the removal of seven intrathoracic new growths with only one death. Roberts started tourniquet lobectomies in 1931 using instruments of his own design for a modified Shenstone technique. He and Nelson published an account of 10 cases in 1933 and Tudor



Edwards and Price Thomas another 48 the following year. Roberts and Tudor Edwards did the first two one-stage tourniquet pneumonectomies for bronchiectasis in the same week at Brompton, soon after Graham devised the operation for bronchial carcinoma. The first dissection lobectomy at Brompton was done by Tudor Edwards in April 1929 on a boy of sixteen, and the first dissection pneumonectomy by Price Thomas for a peripheral carcinoma in March 1935. Some idea of the volume of surgical work and its rate of increase may be gained from the fact that in 1939 Tudor Edwards reviewed 199 cases of bronchiectasis which he had treated surgically—166 lobectomies and 33 pneumonectomies. His experience with bronchial tumors was given in two fine papers in 1938 and 1946. The latter paper, published in the first issue of *Thorax*,



FIGURE 23: Arthur Tudor Edwards.

was the opening Presidential Address to the Society for the Study of Diseases of the Chest which he founded shortly before his untimely death.

I have brought this account to the present time and of necessity have been selective. I have emphasized the early rather than the later history because the present place of Brompton in English Medicine derives from its record last century, not only in the sense of the achievement then, but also in the sense of the inspiration which that achievement still imparts. If, moreover, I seem to have laid stress upon one aspect of the hospital—its place in the advancement of learning—I trust that I have not overlooked the reasons why we in England regard the Brompton with so much affection. For it is, indeed, an atmosphere rather than an institution—a phrase by which Kingston Fowler once described a sanatorium. Inherent in this atmosphere are regard for wisdom and respect for the past, though there is something more intimate than either of these. Perhaps the words of Benjamin Disraeli at the Seventh Anniversary of the Hospital, almost a hundred years ago, were prophetic of this quality: "It has been considered that consumption is an incurable disease. . . . All of us must feel that the secrets of nature cannot yet be told; and in an age distinguished as the present for the application of science to social life he is indeed a bold man who can say that he is to fold his arms in despair and sit down, and when he encounters a calamity can believe that a beneficent Providence which surrounds us has not supplied man with some remedial resource."

I am indebted to many friends and colleagues for help and guidance; in particular, to Mr. Rouvray, Secretary to the Hospital, who generously placed his collection of documents and his expert knowledge of the subject at my disposal; to Mr. Bishop, Librarian to the Wellcome Historical Museum, who enlivened our antiquarian researches and whose department did many of the fine illustrations; to Dr. Maurice Davidson, who read the manuscript for me; to Dr. J. V. Simpson, who collected much information towards it; and to Dr. Foster Carter for some of the prints.

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## Summary of Case Reports

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CASE NO. 1: A colored female, aged 24 years, was admitted in 1935 with protracted lympho-hematogenous tuberculosis with chronic pulmonary tuberculosis, tuberculous lymphadenitis, pericarditis and invasion of the myocardium. There was, in addition, dissemination to other viscera on autopsy examination. On serial x-ray films of the chest, the patient also presented very suggestive evidence of rupture of a caseous lymph node into a bronchus which was confirmed by necropsy.

CASE NO. 2: A 32 year old white female, a contact case to her mother who died of tuberculosis, was admitted to the hospital September 1946, largely on the basis of an x-ray film of the chest. The initial impression from the x-ray film was possible lymphosarcoma, Hodgkin's Disease, or Boeck's Sarcoid. Very soon after admission, it became apparent on the basis of a rectal examination and biopsy of a rectal mass, that we were dealing with a primary adeno-carcinoma of the rectum with metastasis to the mediastinum and lungs. This was confirmed by postmortem examination. Metastases elsewhere were also found. It is interesting to comment here on the rapidity of the progress of the malignancy in this young adult patient and the fact that the roentgen film of the chest was not entirely characteristic of the classical picture of metastatic involvement.

CASE NO. 3: The case of a 24 year old white soldier with a rather typical clinical history and serial x-ray evidence of primary pulmonary coccidioidomycosis was presented. Coccidioidin skin test was positive and the fungus was recovered on Sabouraud's glucose agar medium. The roentgen residue of the pulmonary process was represented by a productive linear infiltrate in the upper portion of the left lung, which by itself could be readily misinterpreted as tuberculosis.

CASE NO. 4: The case of a 37 year old white soldier was shown who had a post-pneumonic staphylococcic empyema which was treated by combined penicillin therapy (intramuscularly and intrapleurally) in conjunction with repeated pleural lavage with sterile normal saline solution. Cure of the empyema was obtained with obliteration of the pleural space and re-expansion of the lung with residual pleural thickening. The final roentgen appearance of the re-expanded lung was comparable to that which could have been achieved by thoracotomy. This case was presented as an example of what may sometimes be achieved by the above method in some selected cases of empyema, but is by no means the preferred treatment in the vast majority of pyogenic empyemas. Surgical drainage is still the basic therapy.

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\*Case reports presented at a meeting of the New Jersey Chapter, American College of Chest Physicians, Berthold S. Pollak Hospital for Chest Diseases, Jersey City, N. J., January 27, 1948.

CASE NO. 5: A white male, aged 63 years, was admitted August 1947, and discharged December 1947. His chief complaint was that of repeated hemoptyses of fair amounts of bright red blood. His sputa were negative except for one which showed tubercle bacilli on cultures. Subsequent cultures were negative. The roentgenogram of the chest showed the entire right apex to be occupied by a rarefied shadow which strongly simulated a large emphysematous bulla. Bronchoscopy revealed frank blood to be coming from the right upper lobe bronchus and the bronchial opening was free of any growth. Patient came to operation undiagnosed. The lobe was removed and on section it was found to be occupied by a large abscess cavity due to destruction of the lobe by carcinoma.

CASE NO. 6: A white female, aged 19 years, admitted May 1947, discharged July 1947. Chief complaint, productive cough and hemoptysis. Exposed to an aunt who had tuberculosis. In the past she had had frequent colds. Sputum was persistently negative. Roentgenogram of the chest showed a minimal lesion of the right 2nd interspace which was diagnosed tuberculous in view of the history of contact and the symptoms. Culture of sputum over a period of 24 hours, however, showed 4 ozs. of mucopurulent sputum which was non-odorous. Further investigation revealed moderately coarse rales along the left para-vertebral region in the lower half of the chest. About 10 days after admission fluoroscopy showed the bronchopneumonic infiltrate along the left cardiac margin and patient was placed on penicillin aerosol to which she responded very favorably by subsidence of sputum and resorption of the bronchopneumonia. Subsequent bronchography revealed a cylindrical bronchiectasis of the left lower lobe. Lobectomy was performed.

CASE NO. 7: A white female, 46 years of age, admitted December 1946, discharged March 1947. Chief complaint was that of loss of weight and weakness. Transferred from the General Hospital where she had been treated for a pneumonia. Roentgenogram of the chest revealed a more or less circumscribed round density in the right upper lobe and a few minute calcified spots in the apex. Gastric washings were negative for tubercle bacilli. Explored with a pre-operative diagnosis resting between tuberculoma and malignancy. At operation a large tuberculoma was found, the lobe was removed and patient treated postoperatively with streptomycin. She made an uneventful recovery.

CASE NO. 8: A white male, aged 63 years, admitted January 27, 1947 and expired February 5, 1947. Niece case of pulmonary tuberculosis but no other contact. On January 18, 1947 he developed sudden weakness, fever and chills. These symptoms were shortly followed by cough and hemoptysis. On admission examination he revealed the following: Blood pressure 170/100, pulse rate 100 but regular, loud blowing systolic murmur in the mitral area. Temperature 104°. Liver enlarged and had pretibial edema and was jaundiced. Roentgenogram of the chest showed a mottled infiltrate extending from both hilae peripherally to the midlung fields. Laboratory studies to determine the cause of the jaundice revealed a hepatogenous form of icterus. The premortem diagnosis rested between three possibilities: 1) Acute tuberculosis; 2) Lymphogenous metastatic infiltration; 3) Cardiac failure with pulmonary congestion.

At autopsy hematogenous tuberculosis was found with dissemination to the various organs, particularly the liver which was loaded with tubercles.

## Editorial

### THE SPECIALTY OF CHEST DISEASES

We have been witnessing an unprecedented expansion of scientific information pertaining to internal medicine during the past few decades. The accumulation of newly acquired scientific data has led to a crystallization and acceptance of new branches of this specialty. Thus, cardiology, gastro-enterology, endocrinology and allergic diseases have been recognized as subjects to which full-time training and devotion are to the best interest of the patient.

For some years, there has been a growing consciousness in medical circles of the importance of specialized training in *chest diseases*. Since its inception, the American College of Chest Physicians has championed this issue. The founders of this organization had the vision in focusing their efforts on the need of thorough education in this particular field. Though new paths in science are always hard to break, unrelenting endeavors and undaunted conviction by the Fellowship of the College brought about welcome results.

The brilliant achievements of a concerted, organized campaign directed toward the eradication of tuberculosis should serve as an example of what can be attained by intelligent approach to the prevention and treatment of human disease. While recognizing the bearing of socioeconomic factors on this problem, it cannot be disputed that the application of intensified and improved methods of prevention and treatment as carried out by the medical profession have had a cardinal role in the remarkable results accomplished. It is with justifiable pride to say that through better and greater medical service, the tuberculosis mortality rate has been reduced by nearly two-thirds during the past quarter of a century.

There are a number of other *chest diseases* which should challenge the ingenuity and determination of progressive-minded physicians. Diseases of the various organs and structures of the chest represent a large enough group and a complexity of problems to completely engage the talent and ability of interested physicians. Competence and efficiency in handling these conditions are more readily acquired when studied as interrelated items. The very nature of the close anatomic and functional connections between the organs potentially involved implies that only through a correlated understanding of each problem is it possible to diagnose and treat *diseases of the chest*.

The task ahead of us is a tremendous one. Its ramifications reach from acute and chronic nontuberculous bronchopulmonary infections to allergic manifestations in the respiratory tract, to neoplasms, congenital malformations, circulatory failure, emphysema and other conditions. Acute and chronic illnesses, invalidism and disabilities resulting from them represent not only much suffering but also incalculable economic loss to the patient as well as to the community. It can be stated, that by the early application of modern diagnostic and therapeutic methods much can be done for shortening the course of some of these diseases and—what is even more significant—for obviating the misery of chronic incapacitation and for saving the community millions of productive working days every year.

Let us examine some pertinent facts. At the 1947 annual meeting of

the College, Rienhoff reported on a group of 327 cases of primary bronchogenic carcinoma. According to his clinical observations, 66 per cent of these patients were admitted to the hospital with tumors already in the inoperable stage. Assuming that the same situation holds true of other large public institutions, these findings are certainly startling and tragic. At the same time, they serve to explain why approximately 16,000 individuals die of this single cause each year. Is it not time to begin combatting this state of affairs? The reported yearly increase in primary bronchogenic carcinoma only adds emphasis to such endeavor. No doubt, a new orientation as to the diagnosis of this condition is in order. If diagnosis is delayed until local or constitutional symptoms bring the patient to the physician, in a great many instances the life of the patient with primary bronchogenic carcinoma cannot be saved. This being so, the practicing physician as well as the coming generation of medical men should bear in mind that searching for carcinoma in the apparently healthy is more likely to lead to its early discovery and curability than waiting until symptoms of the disease develop.

We are approaching an era when we will be called upon more and more often to make diagnosis of subclinical rather than clinical conditions. Relative to primary carcinoma of the lung, x-ray examination of the chest, searching for malignant cells in the bronchial secretions, bronchoscopic intervention and other accessory examinations are invaluable means for the early discovery of bronchogenic carcinoma. Qualified private physicians should be able to equal or even exceed the results of mass x-ray surveys of large blocks of the population. These surveys have proved that early discovery of tuberculosis as well as non-tuberculous conditions of the chest is a reality. So is modern thoracic surgery. With the combination of these two, the prospective reduction of the regrettably high mortality rate of pulmonary cancer is not a "Utopian Dream." Of course, one of the prerequisites of such success is the acquisition of special training in *chest diseases*.

Other instances where expert management of the sick may forestall serious consequences are pulmonary diseases which may lead to bronchiectasis. It is beyond the scope of this discussion to deal with the mechanics of the development of this disease. Suffice it to say that a great variety of pathologic changes in the bronchi and the lung parenchyma may be the direct or indirect source of bronchial dilatation. The death toll of bronchiectasis is not as familiar to the medical profession as it ought to be. Bonniot (1936) reported that one-third of children with bronchiectasis died in from two to three years. Perry and King (1940) concluded from the analysis of their cases in whom bronchiectasis developed before the age of ten years that 65 per cent were dead within twenty years and 90 per cent within thirty years. These appalling figures should have no place in our times. During the past few years, tremendous advances have been made in the medical and surgical management of this disease. On the basis of experience with modern therapeutic methods, it is reasonable to predict a radical improvement in the life expectancy and symptomatic amelioration of these patients, provided of course, that adequate measures are applied early and selectively. Even where surgical intervention is not indicated, a great deal may be achieved by conservative means. It is possible to completely eliminate the bronchial infection by chemotherapy, antibiotics and mechanical relaxation measures. We are confident that recent trends in medical training will effectively cope with this problem.



One could go on and on enumerating chest conditions in which a wider application of known facts and methods would bring about improvement in therapeutic results. For instance, a great many victims of emphysema represent such a group. Industrial medicine is in crying need of the services of men well trained in *chest diseases*. Prevention, diagnosis and treatment of diseases of the cardio-respiratory organs call for much more qualified physicians in this field than are available at the moment. Silicosis is only one of the pneumoconioses. Men are exposed to the massive inhalation of silica in a wide variety of occupations, such as mining, foundry work, pottery, granite cutting, abrasive soap manufacturing, spray-coating and others. More and more recognition is given to the fact that silicosis is not merely pulmonary fibrosis but it is commonly associated with emphysema. The latter may be microscopic or grossly evident. In any event, it adds to or aggravates the patient's actual or potential disability. The possible development of failure of the right ventricle and complicating tuberculosis are no small items in the fate of the individual with silicosis. These are satisfactory methods for the recognition of the disease itself as well as of its complications. Why not provide adequate medical service for these persons through specialized training?

Methods for estimating cardiac insufficiency are generally accepted in clinical practice. The same cannot be said about pulmonary function tests. There is no reason why this lag should exist. Since the pioneering work of Jacobaeus (1936) with bronchspirometry, estimation of the function of the right and left lung separately has become practicable. The technique of this procedure can be readily acquired. Bronchspirometry is of great help in determining the degree of disability which may arise from emphysema, pneumoconiosis and decompensated heart disease associated with pulmonary congestion. Occasionally, medico-legal issues may be clarified with the aid of this method. Also, an equitable decision may be brought in questions of industrial disability and in determining the liability of insurance carriers in certain types of acute or chronic pulmonary diseases. Hurtado and Fray (1933), Cournand and his associates (1939, etc.) and others have contributed substantially to the development of suitable methods for estimating pulmonary function. All these are of value in assaying the respiratory capacity and work tolerance of the individual with certain diseases of the lung. Versatility with these methods is mandatory as far as modern practice of *chest diseases* is concerned. Among other valuable diagnostic methods, mention should be made of tomography, roentgen kymography, angiocardigraphy and catheterization of the heart for functional measurements. There is a growing demand for these specialized services. Simultaneously there is an increasing recognition of the need for thorough training in *chest diseases*.

In this connection, it should be mentioned that *chest diseases* as a specialty have been given emphatic recognition in the unanimous approval by the House of Delegates of the American Medical Association at Atlantic City in June 1947, whereby a Section on Diseases of the Chest has been established as part of the scientific program of each annual meeting of the American Medical Association. In accordance with this splendid resolution, a highly interesting scientific program on *chest diseases* has already been arranged for the coming annual convention of the American Medical Association which is to be held at Chicago in

June 1948. It is ardently hoped that a large registration at this new section will vindicate its usefulness to the medical profession.

As another interesting item concerning *chest diseases*, it is gratifying to note in the December 20, 1947 issue of The Journal of the American Medical Association the listing of postgraduate courses for the period January 1, to July 15, 1948. In it, the heading "Chest Diseases" is prominently displayed. Heretofore, postgraduate courses in chest diseases were listed under tuberculosis and, more recently, under pulmonary diseases. The term "chest diseases" is broad enough to cover all pulmonary diseases, including tuberculosis.

In the aforementioned listing, courses limited to pulmonary diseases and tuberculosis are listed under the main heading of *Chest Diseases*. The specialty of *chest diseases* has finally come into its own and is receiving its proper recognition from medical societies other than the College. The Fellowship of the American College of Chest Physicians and the Editorial Board of *Diseases of the Chest* are grateful to the Council on Medical Education and Hospitals of the American Medical Association for clarifying this situation.

A. L. B.

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#### TUBERCULOSIS ERADICATION BEING ACHIEVED

In this issue of *Diseases of the Chest*, Dr. Jordan presents the most effective demonstration of tuberculosis control that has ever been reported. He has even gone beyond control to eradication. Beginning in 1930 he developed a program based on fundamental methods. Starting with the premise that tuberculosis is contagious, he proceeded to prevent the dissemination of tubercle bacilli from humans who were eliminating them and to assist the veterinarians at every opportunity in the eradication of tuberculosis from cattle. His eight-point program has omitted nothing of importance and, therefore, it is an ideal procedure which can and should be adopted everywhere. The efficaciousness of Dr. Jordan's program has been proved beyond the shadow of a doubt. The only method of determining the effectiveness of a tuberculosis control program is periodic tuberculin testing of all children born since the work began and comparing the findings with those previously established. If tuberculosis control work is effectively prosecuted the chances of children developing primary tuberculosis (tuberculous infection) should decrease from year to year through the removal of contagious cases in humans and animals from the environment and preventing others from becoming contagious. Wherever such a program is in operation one might expect soon to see all children of one year of age without contamination with tubercle bacilli and therefore nonreactors to tuberculin. This means eradication of tuberculosis at this age level. With the continued protection of these children, as well as those subsequently born, the age level at which tuberculosis is eradicated obviously increases from year to year.

In the past such an accomplishment may have seemed highly theoretical and speculative to many physicians engaged in tuberculosis work. Regardless of anyone's previous opinion, every physician must now disabuse his mind of the idea that tuberculosis cannot be eradicated in this manner. Dr. Jordan has proved the point. He began in 1930, when 14 per cent of the school children in his four-county district were found to have primary tuberculosis (tuberculous infection). In 1946 and 1947, only

2.5 per cent of the children in these same schools had this disease. In fact, of the 277 schools under consideration there were 219 in which no child had primary tuberculosis as manifested by the tuberculin reaction. *This means eradication of tuberculosis at the school age level in these 219 schools*—an accomplishment apparently never before reported. The chances of children becoming infected in this environment subsequently are extremely slight. Therefore, if the present program continues one might expect the majority of them to live out their lives without the hazards of tuberculous infection.

On numerous occasions in the past, persons became over-enthusiastic and launched slogans such as "No Tuberculosis by 1920"; "No Tuberculosis by 1960"; "No Tuberculosis by the Year 2000"; "No Tuberculosis In Our Time," etc., etc. Obviously those who prepared and publicized such slogans had not carefully analyzed the situation. Apparently they overlooked the fact that some healthy-appearing children who reacted to tuberculin and therefore had live tubercle bacilli containing lesions in their bodies would have living descendants of these organisms for decades or as long as they lived.

Even if all infection were to stop today, tuberculosis could not possibly be eradicated by the year 2000. There are now infants and young children with primary lesions who will only be approximately 53 years of age when the year 2000 arrives. Among them are sure to be some whose lesions contain the progeny of tubercle bacilli now present. Some such persons in this age period will through endogenous reinfections develop clinical lesions after the year 2000. However, by that time tuberculosis eradication would be realized among all persons of 53 years or younger and in Dr. Jordan's district of 68 years or younger. Therefore in the year 2000 it would be necessary to keep under close observation, only those beyond these ages.

Obviously, in Dr. Jordan's district there is considerable residual tuberculosis, largely in the form of primary lesions, in the bodies of the older citizens who were not protected against infection in childhood or early adulthood. However, this number is not as great as one might suspect. This is because some persons were never infected, whereas, in others the tubercle bacilli have vanished, and therefore they are nonreactors to tuberculin. The exact percentage of older persons with tubercle bacilli still alive in the lesions of the primary complexes is not known. It could be accurately determined by testing all adults. In fact, Jordan states that of 3,698 teachers and other personnel members of the schools, ranging from 21 to 71 years, only 21.6 per cent reacted to tuberculin.

Whatever the number of adults who now have living tubercle bacilli in their bodies, the main problem of the future consists of keeping these persons under close observation so that those in whom lesions evolve to clinical proportions may have them detected before they become contagious and when they are readily treatable. This will keep liberated tubercle bacilli from the environment of the children, and thus the age level at which the disease is eradicated will increase from year to year.

Dr. Jordan's demonstration is the first in the world to prove conclusively that tuberculosis can be eradicated from humans. All theoretical considerations were eliminated and only well-established, fundamental procedures were employed. To conduct such a program requires a great deal of work, but it is the only known method of attaining the ultimate goal—eradication.

J. A. M.

# Fourteenth Annual Meeting

## AMERICAN COLLEGE OF CHEST PHYSICIANS

*Congress Hotel, Chicago, Illinois*

JUNE 17 - 20, 1948

### PRELIMINARY PROGRAM

#### THURSDAY, JUNE 17

Oral and Written Examinations for Fellowship.  
Executive Council Meeting.  
Board of Regents Meeting.  
Board of Governors Meeting.  
Council and Committee Meetings.

#### FRIDAY, JUNE 18

##### 9:00 - 12:00 Session No. 1

*Moderator:* Dr. Edwin R. Levine, Chicago, Illinois.

*Speakers:* Dr. Francisco Torres, et al, Cordoba, Argentina,  
"Pulmonary Resection in Tuberculosis."  
Dr. Charles P. Bailey, Philadelphia, Pennsylvania,  
"Lung Resection in Tuberculosis."  
Dr. George Wright, Saranac Lake, New York,  
"Effect of Disease on Pulmonary Physiology."  
Dr. George Ornstein, New York City,  
"Pulmonary Function."

##### 2:00 - 5:00 p.m. Session No. II

*Moderator:* Dr. Richard H. Overholt, Brookline, Massachusetts.

*Speakers:* Dr. Irving Sarot, New York City,  
"Enucleation Technique for Lung Containing Adhesions."  
Dr. Karl Poppe, Portland, Oregon,  
"Treatment of Aortic Aneurysms."  
Dr. Willis J. Potts, Chicago, Illinois,  
"Recent Advances in Intrathoracic Vascular Surgery."  
Dr. O. T. Clagett, Rochester, Minnesota,  
"Surgical Treatment of Giant Bullous Cysts."  
Dr. Evarts A. Graham, St. Louis, Missouri,  
"The Problem of Cancer of the Lung."

#### SATURDAY, JUNE 19

##### 10:30 - 12:00 Session No. III — X-ray Conference.

Dr. L. H. Garland, San Francisco, California.

Physicians wishing to participate in the X-ray Conference, please refer to page xiv for instructions regarding films to be submitted.

##### 2:00 - 4:30 p.m. Session No. IV — Symposium on BCG.

*Moderator:* Dr. Francis J. Weber, Washington, D. C.  
(Titles to be announced).

#### SUNDAY, JUNE 20

##### 9:00 - 12:00 Session No. V

*Moderator:* Dr. Andrew L. Banyai, Milwaukee, Wisconsin.

*Speakers:* Dr. Marcio Bueno, New Bedford, Massachusetts,  
"Diagnostic Bronchial Lavage in Tuberculosis."



Dr. George N. Papanicolaou, New York City,  
"Diagnosis by Sputum Examination."

Dr. Seymour M. Farber, San Francisco, California,  
"Cytologic Diagnosis of Primary Carcinoma of Lung by  
Means of Sputum and Bronchial Secretions."

Dr. Maurice M. Black, Brooklyn, New York,  
"Blood Diagnosis of Cancer."

Dr. Andres Soulas, Paris, France,  
"Study of Bronchial Stenosis in Bronchopulmonary  
Tuberculosis."

2:00 - 5:00 p. m. *Session No. VI*

*Moderator:* Dr. Harry C. Warren, San Francisco, California.

*Speakers:* Dr. Walter Nalls, Oteen, North Carolina,  
"Diet in Treatment of Tuberculosis."

Dr. Allan Hurst, Denver, Colorado,  
"Psychologic Problems in Tuberculosis."

Dr. Italo Volini, Chicago, Illinois,  
"Treatment of Pneumonia with Penicillin in Oil  
(Romansky)."

Dr. Maurice Segal, Boston, Massachusetts,  
"Facts and Fancies in Management of Bronchial Asthma."

NOTE: The Committee on Scientific Program of the College has  
arranged the above program so that there will be ample  
time for discussion from the floor.

ANNUAL BANQUET, 7:30 p. m., Saturday, June 19.

LUNCHEON MEETINGS

*Thursday, June 17:* Annual Conference of College Chapter Officials.

*Friday, June 18:* Annual Conference of Medical Directors and Super-  
intendents of Tuberculosis Hospitals and Sanatoria.

*Saturday, June 19:* Council on International Affairs.  
Council on Pan American Affairs.  
Council on European Affairs.  
Council on Pan Pacific Affairs.

*Sunday, June 20:* Annual Conference, Council of Tuberculosis Com-  
mittees.

NOTE: The Annual Convocation will be held at 6:00 p. m., Saturday,  
June 19.

Physicians in foreign countries have been invited to participate in  
the program and their names and subjects will be published in the  
next issue of *Diseases of the Chest*.

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SESSION ON DISEASES OF THE CHEST  
SCIENTIFIC ASSEMBLY, AMERICAN MEDICAL ASSOCIATION  
JUNE 24, 1948

OFFICERS:

Richard H. Overholt, M.D.  
Brookline, Massachusetts  
*Chairman*

J. Winthrop Peabody, M.D.  
Washington, D. C.  
*Secretary*

SYMPOSIUM ON STREPTOMYCIN:

Dr. Emil Bogen, Los Angeles, California,  
"Laboratory Aspects of Streptomycin."

Dr. H. C. Hinshaw, Rochester, Minnesota,  
"Streptomycin in Extrapulmonary Tuberculosis."

Dr. Karl H. Pfuete, Cannon Falls, Minnesota,  
"Streptomycin in the Treatment of Tuberculosis."

Dr. William Tucker, Minneapolis, Minnesota,  
"Experience with Treatment of Various Forms of Tuberculosis with  
Streptomycin in the Veterans Administration."

Dr. Brian B. Blades, Washington, D. C.,  
"Use of Streptomycin in Surgical Patients."

Dr. Chester Keefer, Boston, Massachusetts,  
"Antibiotics in Relation to Non-Tuberculous Chest Disease."

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## Report of Council on Public Health

The Council on Public Health of the American College of Chest Physicians met in Baltimore at 3:00 p. m. on Monday, November 24, 1947. The ensuing discussion centered mainly about the nation-wide case-finding program for tuberculosis. This program is being extended every day and a certain cut pattern has begun to emerge, a pattern which is the result of several years of experience in this field. Moreover, it is the opinion of the Committee that the overall pattern which has been developed is a successful and worthy one. Therefore, the Council feels that the Tuberculosis Control Division of the U. S. Public Health Service should continue its present activities in that field with a view toward covering the whole nation in its case-finding program. It is believed that certain phases of this activity deserve particular attention with a view toward seeing that (1) case-finding is carried out among all persons admitted to the out-patient and in-patient departments of hospitals, especially general hospitals, (2) private practitioners, to an increasingly extent, encourage x-ray examination of the chest of all patients encountered in private practice, (3) community-wide surveys of the adult population should be undertaken wherever practicable, and (4) other special groups such as industrial groups should be encouraged to take an active role in special case-finding activities.

Since such chest x-ray case-finding programs will develop a need for a great deal of follow-up, not only for cases of tuberculosis but for other chest conditions found as a result of such examinations, it is obvious that a great deal of special knowledge will be necessary on the part of physicians participating in diagnostic follow-up. It was felt that the membership of the American College of Chest Physicians is in a unique position to lend the medical assistance that is needed in this follow-up program. Much can be done toward promoting post-graduate training of physicians in chest diagnosis, acquainting them with the proper follow-up procedures to be carried out. Some of this is already being done in the regular postgraduate courses of the College. A great deal more of this medical assistance is needed in the way of additional courses and also in putting an educational program on chest diseases into effect through local medical societies.

In order to make any tuberculosis control case-finding program effective, it will be necessary to insure minimum follow-up services in terms of quality and quantity.

Paul A. Turner, M.D.

Louisville, Kentucky, *Chairman.*

## College Chapter News

### ARGENTINE CHAPTER

At the Second Annual Meeting of the Argentine Chapter, which was held at "Tigre," Cruz Colorada on December 8, 1947, the following officers were elected for the year 1948:

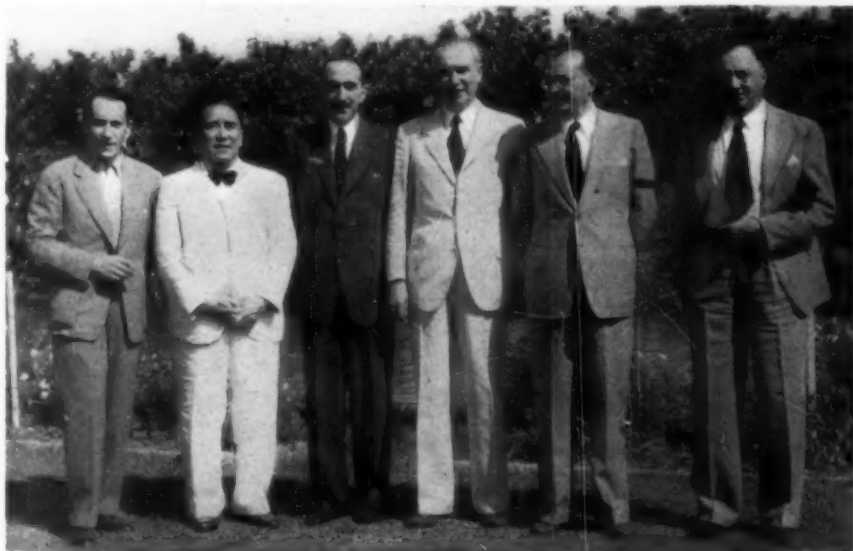
Dr. Agustin Caeiro, Cordoba, President.

Dr. Justo Lopez Bonilla, Rosario, Vice-President.

Dr. Angel N. Bracco, Buenos Aires, Secretary-Treasurer.

A scientific program was presented, as published in the January-February issue of the College journal, which was followed by a luncheon meeting. Dr. Chevalier L. Jackson, Philadelphia, Pennsylvania, Chairman of the Council on Pan American Affairs of the College, was guest speaker at the luncheon. Dr. Raul F. Vaccarezza, Buenos Aires, Governor of the College for the Argentine, and past-president of the Argentine Chapter, delivered a report of the activities of the chapter during the year 1947 and made special mention of the visit to the Argentine of Dr. Richard H. Overholt, Brookline, Massachusetts, President-Elect of the College, and Mr. Murray Kornfeld, Executive Secretary. Dr. Vaccarezza then introduced Dr. Jackson and spoke highly of the excellent organization established in the Latin American countries through the efforts of Dr. Jackson and the members of his Council. Dr. Jackson responded with

*Second Annual Meeting, Argentine Chapter  
American College of Chest Physicians  
"Tigre" Cruz Colorada, December 8, 1947*



Left to right: Dr. Angel N. Bracco, Buenos Aires, Secretary-Treasurer, Argentine Chapter; Dr. Gumersindo Sayago, Cordoba, Regent of the College; Dr. Agustin Caeiro, Cordoba, President, Argentine Chapter; Dr. Raul F. Vaccarezza, Buenos Aires, Governor of the College; Dr. Justo Lopez Bonilla, Rosario, Vice-President, Argentine Chapter; and Dr. Rodolfo A. Vaccarezza, Buenos Aires, Fellow of the College.

a report of the aims and purposes of the Council on Pan American Affairs of the College and expressed his appreciation to the officers and members of the Argentine Chapter for their excellent cooperation in the College program and for their splendid hospitality. Dr. Gumersindo Sayago, Cordoba, Regent of the College for the Argentine, was present for the meeting and took part in the scientific program.

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#### CALIFORNIA CHAPTER

The California Chapter of the College will hold its annual meeting in San Francisco on April 10, 1948. Jane Skillen, M.D., F.C.C.P., Olive View, California, Chairman of the Program Committee for the meeting has announced the following tentative program:

- "Streptomycin in Laryngeal Tuberculosis,"  
Bernard Margulies, M.D.
- "Mediastinal Tumors,"  
Thomas Wiper, M.D., F.C.C.P.
- "Carcinoma of the Oesophagus,"  
Lyman A. Brewer, III, M.D., F.C.C.P.
- "Indications for Pulmonary Resection in Bronchiectasis,"  
Paul Sampson, M.D., F.C.C.P.
- "Q Fever,"  
R. J. Huebner, S.A., Surgeon, USPHS.
- "Home Treatment of the Tuberculous Patient,"  
William Kinney, M.D., F.C.C.P.

Other members of the Program Committee are: Cabot Brown, M.D., F.C.C.P., San Francisco; Gordon A. Diddy, M.D., F.C.C.P., Ahwahnee; William A. Kinney, M.D., F.C.C.P., Riverside; and David T. Proctor, M.D., F.C.C.P., Pasadena, California.

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#### CENTRAL BRAZILIAN CHAPTER

The Central Brazilian Chapter of the College met in Rio de Janeiro on November 20, 1947. Due to the absence of the President, Professor Mazzini Bueno, Dr. Reginaldo Fernandez, Governor of the College for Central Brazil, acted as Chairman and Dr. MacDowell Filho acted as Secretary. Dr. Fernandes invited the following doctors to sit at the head table:

- Professor Affonso MacDowell, Regent of the College for Brazil.
- Dr. Alberto Renzo, Director of Division of Tuberculosis in the city of Rio de Janeiro.
- Dr. Francisco Guglioti, Superintendent of the Sao Sebastiao Sanatorium.
- Representative Dr. Odilon Soares, member of the Public Health Commission of the Brazilian Congress.
- Professor Hugo Pinheiro Guimaraes, Vice-President of the Central Brazilian Chapter.
- Dr. Galdino Travassos, President of the Brazilian Tuberculosis Society.
- Professor Antonio Ibiapina, Professor of Tuberculosis of the Medical and Surgical School.
- Dr. Flavio Fraga, Superintendent of the Santa Maria Sanatorium.

The City of Niteroy was chosen for the next meeting of the Central Brazilian Chapter. By suggestion of Dr. Fernandes, the Central Brazilian Chapter expressed regret regarding the recent death of Dr. Rafael



Pardelas, who was one of the founders of the Brazilian Tuberculosis Society.

Two subjects were discussed at the meeting. The first was "Tuberculosis Empyema" and papers on this subject were read by: Drs. C. Branco, S. R. Barboza and Murga Jr., from the Miguel Pereira Hospital; Dr. Jesse Teixeira, et al, from the Santa Maria Sanatorium; Drs. Ugo P. Guimaraes and H. F. Magaras from the Sao Sebastiao Sanatorium; Drs. J. Amelio and J. S. Vizella from the Azevedo Lima Sanatorium. The papers were discussed by Drs. A. Renzo and M. Lobato.

The second subject was "Tuberculosis and Pregnancy" and papers on this subject were presented by Drs. F. Magarao, H. Linhares and A. Vieira from the Central Laboratory, Tuberculosis Division, City of Rio de Janeiro, and by Dr. Roberto Simonard from the N. S. das Dores Hospital. Discussions followed by Drs. A. MacDowell, A. Vieira, L. Dias, A. Ibiapina and U. P. Guimaraes.

Following the scientific session the Secretary of the Chapter, Dr. Affonso MacDowell Filho, presented his report. He gave a brief summary of the history of the College. Four meetings are planned for 1948, the first one to be held during the last week of March. That meeting will be held in the Azevedo Lima Sanatorium, City of Niteroy, State of Rio de Janeiro. For future meetings three subjects are planned for discussion: (1) Non-tuberculous suppurations of the lung; (2) diagnosis of activity in minimal pulmonary tuberculosis; (3) results of collapse therapy.

Dr. Gugliotti, the superintendent of the hospital thanked those present for their choice of his institution for the meeting. To close the session, Dr. MacDowell, the Regent of the College, congratulated those present for the success of the meeting and thanked the hospital for their fine reception. (A photograph of the officials of the Central Brazilian Chapter was published in the January-February, 1948 issue of "Diseases of the Chest").

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#### NEW JERSEY CHAPTER

The New Jersey Chapter of the College will hold its annual meeting at Haddon Hall, Atlantic City in connection with the annual meeting of the Medical Society of New Jersey, April 26-29, 1948. The program for the meeting has been included as a Section on Chest Diseases in the Scientific Assembly of the state medical society and will be presented on Wednesday, April 28. John E. Runnells, M.D., F.C.C.P., Scotch Plains, and Homer H. Cherry, M.D., F.C.C.P., Paterson, were appointed Chairman and Secretary-Treasurer, respectively, of the Section. The program to be presented is as follows:

"Streptomycin in the Treatment of Tuberculosis,"

Carl Muschenheim, M.D., New York, New York.

Discussion opened by Samuel Cohen, M.D., Jersey City, New Jersey.

"Non-Tuberculous Pulmonary Infections Complicating Pulmonary Tuberculosis,"

Otto S. Baum, M.D., F.C.C.P., South Orange, New Jersey, and

Lewis F. Baum, M.D., F.C.C.P., South Orange, New Jersey.

Discussion opened by Irving Willner, M.D., F.C.C.P., Newark, N. J.

"Aerosol Antibiotic Therapy in Suppurative Diseases of the Lungs and Bronchi,"

Benjamin P. Potter, M.D., F.C.C.P., Jersey City, New Jersey.

Discussion opened by Paul K. Bornstein, M.D., F.C.C.P., Asbury Park, New Jersey.

The New Jersey Chapter met at the Berthold S. Pollak Hospital for Chest Diseases, Jersey City, on January 27. The scientific session was preceded by an executive meeting with all of the members of the Executive Committee attending. The scientific session consisted of the presentation of cases by Samuel Cohen, M.D., and B. P. Potter, M.D., F.C.C.P., Jersey City, and Eli Rubin, M.D., F.C.C.P., New York City, acted as moderator. A summary of these case reports can be found on page 298 of this issue of the journal.

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#### OHIO CHAPTER

The Ohio Chapter of the College will hold its annual meeting at the Hotel Gibson, Cincinnati, on Wednesday, March 31. There will be a luncheon at 12:00 noon for College members and guests. Following this, a scientific program will be presented:

"Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis,"  
Myron M. Perlich, M.D., Cleveland, Ohio.

"Primary Tuberculosis. Evaluation and Criteria for Hospitalization,"  
Samuel L. Painter, M.D., Cincinnati, Ohio.

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#### POTOMAC CHAPTER

The Potomac Chapter of the College will hold its annual meeting at the Sheraton-Belvedere Hotel, Baltimore, Maryland on April 26. The following program is to be presented in an afternoon session:

"Modern Concepts in the Surgical Treatment of Pulmonary Suppurative Diseases,"

Walter Crandell, M.D., White River Junction, Vermont.

"Use and Abuse of Pneumothorax,"

John Hayes, M.D., Saranac Lake, New York.

"Resection in the Treatment of Pulmonary Tuberculosis,"

Otto C. Brantigan, M.D., F.C.C.P., Baltimore, Maryland.

"Coronary Disease and Its Complications,"

C. Edward Leach, M.D., Baltimore, Maryland.

Following the scientific session there will be a business meeting, and a cocktail party and dinner will be held in the evening.

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#### PUERTO RICO CHAPTER

The Annual Meeting of the Puerto Rico Chapter of the American College of Chest Physicians, was held on December 11-12, 1947, in conjunction with the Annual Convention of the Puerto Rico Medical Association at San Juan, P. R. During the Administrative Session, held on December 11, the following members were present: Drs. Jaime F. Pou, A. Acosta Velarde, H. Marrero Otero, Ramon T. Colon, Alice Reinhardt, Luis A. Passalacqua, J. de Lara, Leandro Santos, Rafael Velazquez, August Tortorelli, Miguel Alonso, David Garcia, David Rodriguez, Jose Pico, Jose Soto Ramos, Fernando L. Buxeda, and Juan Manuel Moscoso Cordero.

Dr. J. M. Moscoso Cordero, Governor of the College for the Dominican Republic was present as an official guest during the Convention.

The officers for the Chapter during 1947 were re-elected for the year 1948:

Dr. Jaime F. Pou, President.  
Dr. Jose A. Amadeo, Vice-President.  
Dr. Fernando L. Buxeda, Secretary-Treasurer.

The following officers were elected to the Board of Directors for the year 1948:

Dr. Jose Soto Ramos  
Dr. Juan H. Font  
Dr. Rafael Velazquez.

Dr. Luis A. Passalacqua was nominated to succeed Dr. David Garcia as Regent of the College for Puerto Rico, subject to the approval of the Board of Regents when the College meets for its Fourteenth Annual Meeting in June, 1948. Dr. Angel M. Marchand was recommended as Governor of the College for Puerto Rico.

Following the administrative session, a luncheon was held at the Zero Club, Santurce, P. R.

On December 12th, the Scientific Session was held and the following papers were presented:

- "The Present Status of B.C.G. Vaccination,"  
Dr. Juan Manuel Moscoso Cordero.
- "Streptomycin Therapy in Pulmonary Tuberculosis,"  
Dr. E. Martinez Rivera.
- "Pulmonary Changes in Mitral Strictures,"  
Dr. J. Soto Ramos.
- "Bronchiectasis" (followed by moving pictures of a lobectomy for bronchiectasis performed by Dr. David Rodriguez),  
Dr. David Rodriguez.
- "Phrenic Nerve Paralysis and Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis,"  
Dr. Gustavo Bergnes Duran.
- "Streptomycin Therapy in Genito-urinary Tuberculosis,"  
Dr. J. Herman.

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#### PERUVIAN CHAPTER

At the Third Annual Meeting of the Peruvian Chapter of the College, held at the Central Dispensario, Lima, Peru, on December 26, 27 and 29, 1947, the following officers were elected for the ensuing year:

Dr. Ramon Vargas-Machuca, President.  
Dr. Juan Escudero Villar, Vice-President.  
Dr. Leopoldo Molinari, Secretary.  
Dr. Luis E. Hubner, Treasurer.  
Dr. Angel L. Morales, Librarian.

(The program was published in the January-February, 1948 issue of the journal).

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#### SOUTH BRAZILIAN CHAPTER

The South Brazilian Chapter of the College was inaugurated at Sao Paulo on September 28, 1947. The organizational meeting of the chapter was held at the time of a local meeting of the Brazilian Tuberculosis

Society. Dr. Eduardo Etzel, Governor of the College for the South Brazilian States, has reported that the following officers for the chapter were elected:

Dr. Clovis Correa, President.  
Dr. Newton Toledo Ferraz and  
Dr. Mozart Tavares de Lima, Secretaries.  
Dr. Bindo Guida Filho, Treasurer.

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#### TEXAS CHAPTER

The annual meeting of the Texas Chapter of the College will be held at the Rice Hotel, Houston, on April 26, in connection with the annual meeting of the State Medical Association of Texas, April 26-29. The following program will be presented:

##### MORNING SESSION:

Frank H. Carman, M.D., F.C.C.P., Dallas, Texas,  
President, Texas Chapter, presiding.

"Boeck's Sarcoid,"

J. M. Donaldson Jr., M.D., F.C.C.P., San Antonio, Texas.

Discussion opened by:

Wayne A. Riser, M.D., Wichita Falls, Texas.

"Pneumonitis,"

Henry M. Winans, M.D., Dallas, Texas.

Discussion opened by:

R. G. McCorkle, M.D., F.C.C.P., San Antonio, Texas, and  
W. D. Anderson, M.D., F.C.C.P., San Angelo, Texas.

"The Clinical Use of Streptomycin in Tuberculosis,"

Rodger J. B. Hibbard, M.D., Chief of Tuberculosis, Veterans Facility,  
Legion, Texas.

Discussion opened by:

David McCullough, M.D., F.C.C.P., Kerrville, Texas.

"The Problem of Tuberculosis in Texas is the Doctor's Problem,"

Charles M. Hendricks, M.D., F.C.C.P., Chairman, Committee on  
Tuberculosis, State Medical Association, El Paso, Texas.

Discussion opened by:

Howard E. Smith, M.D., F.C.C.P., Austin, Texas.

##### RECESS TO 2:30 P. M.

Nominating Committee will convene during recess.

##### AFTERNOON SESSION:

H. Frank Carman, M.D., F.C.C.P., Dallas, Texas,  
President, Texas Chapter, presiding.

"A Simplified Method for X-Ray Projection with Demonstration,"

Robert B. Morrison, M.D., F.C.C.P., Austin, Texas.

Discussion opened by:

Walter C. Brown, M.D., Corpus Christi, Texas, and  
Tom R. Jones, M.D., F.C.C.P., Houston, Texas.

"Dusts of Clinical Significance,"

T. M. Frank, M.D., Medical Director,  
Pan American Refining Corporation, Texas City, Texas.

Discussion opened by:

Carl A. Nau, M.D., Galveston, Texas, and  
W. W. Coulter Jr., M.D., F.C.C.P., McAllen, Texas.

"Chronic Atelectasis and Pneumonitis of the Middle Lobe,"

Donald L. Paulson, M.D., Dallas, Texas.



## Discussion opened by:

Howard T. Barkley, M.D., Houston, Texas,  
John S. Chapman, M.D., F.C.C.P., Dallas, Texas, and  
Henry R. Hoskins, M.D., F.C.C.P., San Antonio, Texas.

## Business Session and Election of Officers.

## EVENING SESSION:

## 6:00 p. m.—BANQUET.

H. Frank Carman, M.D., F.C.C.P., Dallas, Texas, President, Texas Chapter, American College of Chest Physicians, presiding.

Remarks: Activities and Accomplishments of Committee on Tuberculosis of State Medical Association of Texas,  
Charles M. Hendricks, M.D., F.C.C.P., El Paso, Texas.

Introduction of Jay Arthur Myers, M.D., F.C.C.P., Past President, American College of Chest Physicians, Minneapolis, Minnesota.

## 8:00 p. m.—TAYLOR SCHOOL AUDITORIUM, LOUISIANA AND BELL STREETS,

H. Frank Carman, M.D., F.C.C.P., Dallas, Texas, President, Texas Chapter, American College of Chest Physicians, presiding.

Guest Speaker: Jay Arthur Myers, M.D., F.C.C.P., Past President, American College of Chest Physicians, Minneapolis, Minnesota.  
"Controlling Tuberculosis in a State."

## Sponsors:

## State Organization:

Texas Chapter, American College of Chest Physicians.

## Local Organizations:

Medical Staff, Houston Tuberculosis Hospital,  
Houston Anti-Tuberculosis League,  
Houston Health Department,  
Harris County Dental and Medical Auxiliary,  
Health Council of the Houston-Harris County Community Council.

*Program Committee*

Charles J. Koerth, M.D., Kerrville, Chairman  
Michael A. Cunningham, M.D., Beaumont  
Cuthbert B. Young, M.D., Tyler

*Arrangements Committee, Houston Meeting*

J. Emerson Dailey, M.D., Houston  
Charles K. Bruhl, M.D., Houston  
Walter J. Stork, M.D., Houston

## WISCONSIN CHAPTER

The Milwaukee Metropolitan Section of the Wisconsin Chapter of the College met Friday, January 30, at the Medford Hotel. Dr. Emil Rothstein presented "Basal Tuberculosis." The stimulating paper was followed by an interesting round table discussion.

A February meeting of the Milwaukee Metropolitan Section of the chapter was held at the Medford Hotel on Friday the 27th. Drs. David D. Feld and Valentine O'Malley presented a comprehensive study of "Pulmonary Carcinoma." An interesting round table discussion followed.

## News Notes

Salvador Diaz, M.D., F.C.C.P., Secretary of the Chilean Chapter of the College, reports that the Medical Staff at the Hospital Sanatorio "El Peral," Santiago, Chile, will hold a meeting in May 1948 to review the work of the past ten years at the hospital, especially with regard to the follow-up of patients.

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A meeting of the "Primeras Jornadas Tisiologicas del Ecuador" was held in Guayaquil, Ecuador, November 24-29, 1947. Drs. Juan Tanca Marengo, Jorge A. Higgins, and Ernesto Briones, members of the College, are officials of the society.

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Raymond C. McKay, M.D., F.C.C.P., Youngstown, Ohio, chief of the tuberculosis division of Cleveland City Hospital, spoke on "The Present Status of B.C.G. Vaccine" at a recent meeting of the medical staff of the Mahoning Tuberculosis Sanatorium.

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The new medical director of the Mahoning Tuberculosis Sanatorium, Youngstown, Ohio, is William Newcomer, M.D., F.C.C.P., formerly assistant medical director of the Moore Veterans Hospital at Swannanoa, North Carolina.

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George G. Ornstein, M.D., F.C.C.P., New York City, delivered a talk on "Clinical Experience in the Use of Streptomycin" at a dinner meeting of the Arizona Chapter of the College held at the State Welfare Sanatorium, Tempe, Arizona, on January 24. On January 26, he addressed the staff of the Good Samaritan Hospital in Phoenix. The topic of his talk was "Primary Carcinoma of the Lung."

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Juan R. Herradora, M.D., F.C.C.P., Secretary of the Council on Pan American Affairs of the College, Jersey City, New Jersey, returned recently from a visit to Puerto Rico, where he was very hospitably received by members of the College. Jaime F. Pou, M.D., F.C.C.P., President of the Puerto Rico Chapter of the College, gave a cocktail party in honor of Dr. and Mrs. Herradora at the Condado Hotel. Many members of the College were present, including Drs. Juan Arruga, Ramon T. Colon, J. Rodriguez Pastor, Angel Rodriguez Olleros, David Rodriguez, Luis A. Passelagua, Antonio Acosta Velarde, David Garcia, Fernando Buxeda, E. Martinez Rivera, August Tortorelli, J. Porreta Doric and J. Moscoso Cordero.

Dr. and Mrs. Herradora were luncheon guests of Dr. Martinez Rivera, and they were entertained at a dinner in the home of Dr. Acosta Velarde.

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Dr. Eduardo Etzel, Sao Paulo, Brazil, Governor of the College for the South Brazilian States, will leave Sao Paulo on March 31 for a six weeks stay with Dr. Gustav Maurer at Davos, Switzerland, on a fellowship from the Fundacao Virginia Matarazzo of Sao Paulo. Dr. Maurer is Regent of the College for Europe. Dr. Etzel is planning to visit Dr. Clarence Crafood in Stockholm, Sweden, and Dr. Karl Semb, Governor of the College for Norway, at Oslo, following his stay in Switzerland.

During a recent lecture tour in Toronto, Paul H. Holinger, M.D., F.C.C.P., Chicago, Illinois, was honored at a luncheon given at the University of Toronto Faculty Union. William E. Ogden, M.D., F.C.C.P., Toronto, Regent of the College, arranged the luncheon which was attended by many of the College members in that area.

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Burgess Gordon, M.D., F.C.C.P., Philadelphia, Pennsylvania, will leave the United States on March 20 for a tour of the United States Hospitals in Germany as consultant for the Army. Dr. Gordon will return home on or about April 20th.

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Hector Orrego Puelma, M.D., F.C.C.P., Santiago, Chile, Regent of the College for Chile, left for Europe early in February. He had been invited to give some lectures in London and following his stay in England, Dr. Orrego plans to visit France, Italy and Switzerland, returning to Chile the first part of May.

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Jacob J. Mendelsohn, M.D., F.C.C.P., Chicago, Illinois, is at the present time visiting in California. On February 26, Dr. Mendelsohn visited Dr. J. Segal, Medical Director of the Los Angeles Sanatorium, in Duarte and participated in their staff conference. Dr. Mendelsohn was enthusiastic about the new unit at the Sanatorium which is in the process of completion, comprising a central medical building for all professional services, flanked on either side by three wings of hospital construction, with a total of 204 beds. The sanatorium staff enjoyed Dr. Mendelsohn's visit and appreciated his comments during the conference.

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John M. Preston, M.D., F.C.C.P., Columbia, South Carolina, has been appointed director of the state board of health, division of tuberculosis control, succeeding Dr. Franklin L. Geiger, who has resigned.

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R. Y. Keers, M.D., Aberdeenshire, Scotland, a member of the College, has published a paper entitled "Observations on Rationing in Tuberculosis" in the *British Medical Journal*, issue of February 7, 1948. Dr. Keers is Medical Director of the Red Cross Sanatoria of Scotland.

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The American College of Allergists will hold its annual meeting this year at the Hotel Pennsylvania, New York City, March 12-14. Fred W. Wittich, M.D., F.C.C.P., 423 LaSalle Medical Building, Minneapolis 2, Minnesota, is Secretary of the College.

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Pablo Purriel, M.D., F.C.C.P., Montevideo, Uruguay, has been appointed Professor of "Clinica Semiologica" by the Faculty of Medicine at the University of Uruguay.

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Samuel B. English, M.D., F.C.C.P., superintendent and medical director of the state sanatorium at Glen Gardner, New Jersey, retired November 1, 1947. Joseph A. Smith, M.D., F.C.C.P., assistant medical director, succeeds Dr. English.

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Lewis S. Jordan, M.D., F.C.C.P., Granite Falls, Minnesota, presented a paper on "The Diagnosis of Tuberculosis in Rural Areas" at the annual meeting of the Missouri State Medical Association, St. Louis, on March 15.

## POSTGRADUATE COURSE IN DISEASES OF THE CHEST

The First Annual Postgraduate Course in Diseases of the Chest to be held in Philadelphia, Pennsylvania, under the sponsorship of the American College of Chest Physicians, Pennsylvania Chapter, and the Laennec Society of Philadelphia, will take place at the Warwick Hotel during the week of March 15th. The instructors who will participate in the course and the titles of their lectures are as follows:

- Dr. Hobart A. Reimann,  
"Acute Respiratory Diseases."
- Dr. Leon H. Collins Jr.,  
"Mycotic Infections of the Bronchi and Lungs."
- Dr. Frank W. Konzelman,  
"Pathology of Chronic Broncho-Pulmonary Diseases."
- Dr. Chevalier L. Jackson,  
"Pulmonary Segments in Relation to Broncho-Pulmonary Disease."
- Dr. Peter A. Herbut,  
"Laboratory Methods in Diagnosis of Chest Disease."
- Dr. W. Edward Chamberlain,  
"Radiological Diagnosis of Acute and Chronic Pulmonary Diseases,"
- Dr. Hurley L. Motley,  
"Cardio-Respiratory Physiology."
- Dr. Charles M. Norris,  
"Bronchspirometry; Apparatus and Technique."
- Dr. Hugo Roesler,  
"Cardiac Factors in Chronic Pulmonary Disease."
- Dr. Esmond R. Long,  
"Epidemiology and Control of Tuberculosis."
- Dr. Edward M. Kent,  
"Bronchiectasis."
- Dr. John H. Gibbon Jr.,  
"Surgical Treatment of Bronchogenic Carcinoma."
- Dr. John B. Flick,  
"Mediastinal Tumors."
- Dr. Robert D. Dripps,  
"Anesthesiology in Relation to Thoracic Surgery with Special Reference to Pulmonary Complications."
- Dr. Richard A. Kern,  
"Allergic States in Bronchial and Pulmonary Conditions."
- Dr. Julian Johnson,  
"Cardiac Surgery."
- Dr. Louis H. Clerf,  
"Bronchoscopy in Diagnosis and Treatment of Chronic Diseases of the Chest."
- Dr. Joseph B. Vanderveer,  
"Pulmonary Embolism."
- Dr. Alvan L. Barach,  
"Aerosol Therapy in Sinus and Broncho-Pulmonary Infections."  
"Total Lung Rest in Pulmonary Tuberculosis as Provided by the Immobilizing Lung Chamber."
- Dr. Joseph Stokes,  
"Tuberculosis in Children."
- Dr. David A. Cooper,  
"Diagnosis of Pulmonary Tuberculosis and Evaluation of Activity."



- Dr. C. Howard Marcy,  
"Pneumoconiosis."  
Dr. M. D. Stayer,  
"Sanatorium Administration."  
Dr. Ross K. Childerhose,  
"Principles of Medical Treatment of Pulmonary Tuberculosis with  
Special Reference to Artificial Pneumothorax and  
Pneumoperitoneum."  
Dr. J. Winthrop Peabody,  
"The Use and Abuse of Rest in Pulmonary Tuberculosis."  
Drs. Gabriel Tucker and Herbert R. Hawthorne,  
"Diagnosis and Surgical Treatment of Diseases of the Esophagus."  
Dr. John A. Kolmer,  
"Chemotherapy of Tuberculosis."  
Dr. Richard H. Overholt,  
"Surgery of Pulmonary Tuberculosis."  
Dr. E. Spurgeon English,  
"Psychosomatic Influence in Chronic Pulmonary Diseases."

The following physicians have been enrolled in the course:

Edmund G. Beacham, Baltimore, Maryland  
B. G. Begin, Montreal, Canada  
Frank L. Bradley, Tahhina, Oklahoma  
John J. Brosnan, Chicago, Illinois  
H. C. Burkhead, Long Branch, New Jersey  
M. L. Connell, Wartrace, Tennessee  
Patrick H. Corrigan, Trenton, New Jersey  
John Dimun, Trenton, New Jersey  
C. H. Dorval, Quebec City, Canada  
B. J. Ellmers, New Milford, New Jersey  
George F. Evans, Clarksburg, West Virginia  
Arthur D. Fisher, Glenn Dale, Maryland  
J. V. Foster Jr., Harrisburg, Pennsylvania  
D. R. Garrett, Weston, Ontario, Canada  
James R. Granger, Trenton, New Jersey  
Matthew R. Hadley, McKeesport, Pennsylvania  
Jesse G. Hafer, Pottstown, Pennsylvania  
J. J. Hennessy, Hartford, Connecticut  
Howard L. Hull, Yakima, Washington  
Elmore P. Kalbaugh, Glenn Dale, Maryland  
Fred Kosanovic, Detroit, Michigan  
Ruben Laurier, Montreal, Quebec  
Julius Lipson, Lockport, New York  
E. Leo Lynch, Montreal, Canada  
Simon Marcus, Sherbrooke, P. Q., Canada  
Phillip M. McNeill, Oklahoma City, Oklahoma  
Edgar R. Miller, Wilmington, Delaware  
D. D. Monroe, Alton, Illinois  
Clarence B. Moore, Harrisburg, Pennsylvania  
A. H. Nejat, Woodhaven, New York  
G. Leonard Oxley, Harrisburg, Pennsylvania  
W. B. Patterson, Huntingdon, Pennsylvania  
H. R. Patton, Damascus, Pennsylvania  
Thomas H. Phalen, Binghamton, New York  
H. E. Peart, Hamilton, Ontario, Canada  
Jacob J. Pfeifer, Brooklyn, New York  
H. E. Perez, Valhalla, New York  
Arthur Powers, Ottawa, Canada  
William H. Rodgers, Philadelphia, Pennsylvania  
Nil Madhab Sinha, Calcutta, India  
John R. Spannuth, Reading, Pennsylvania  
Bernard G. Slipakoff, Philadelphia, Pennsylvania  
Alexander Victor, Butler, Pennsylvania  
Walter E. Vest, Huntington, West Virginia  
Joseph J. Witt, Utica, New York

Lawrence A. Wilson, Absecon, New Jersey  
Francis J. Welch, Portland, Maine

*Medical Officers, U. S. Army:*

Lt. Col. Frank L. Bauer, Washington, D. C.  
Col. Roosevelt Cafarelli, Phoenixville, Pennsylvania  
Lt. Col. Henry A. Kind, Fort Dix, New Jersey  
Captain Richard E. Mardis, Denver, Colorado  
Lt. Col. Charles K. Morris, Mitchel Field, New York

*Medical Officers, U. S. Navy:*

Lt. Comdr. Bruce L. Canaga Jr., Philadelphia, Pennsylvania  
Lt. (jg) Lowell E. Golter Jr., Philadelphia, Pennsylvania  
Lt. James L. Mulcahy Jr., Philadelphia, Pennsylvania  
Captain Walter H. Schwartz, Philadelphia, Pennsylvania

*U. S. Veterans Administration:*

Felix A. Hughes Jr., Memphis, Tennessee  
Joseph N. Miller, Fort Howard, Maryland  
Harry Nushan, Kecoughtan, Virginia  
Sam Poller, Castle Point, New York  
P. E. Schools, Martinsburg, West Virginia  
A. Wolbarsht, Lake City, Florida

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#### NEW FELLOWS

The following candidates successfully passed the oral and written examinations for Fellowship, which were held in November 1947 by the Board of Examiners, and they are entitled to receive their Fellowship Certificates at the next Convocation of the College:

Reuben M. Anderson, M.D., Hackensack, New Jersey  
Mary C. Block, M.D., Santa Ana, California  
Walter C. Brown, M.D., Corpus Christi, Texas  
Joseph J. Burrascano, M.D., New York, New York  
William S. Burton, M.D., Richmond, Virginia  
Jessie A. Lockhart, M.D., Houston, Texas  
David Meyers, M.D., New York, New York  
Robert B. Morrison, M.D., Austin, Texas  
Luther Byron Newman, M.D., Legion, Texas  
John L. Pool, M.D., New York, New York  
M. J. Rajanna, M.D., Oak Terrace, Minnesota  
James A. Rogers, M.D., Paterson, New Jersey  
Selig B. Weinstein, M.D., Oakland, California.

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#### ANNUAL MEETING

##### AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION

The 29th Annual Meeting of the American Broncho-Esophagological Association will be held in Atlantic City at the Chalfonte-Haddon Hall on the afternoons of April 7 and 8, 1948. A resume of the program is as follows:

"Bronchial Adenomas,"

Louis H. Clerf, M.D., F.C.C.P., Philadelphia, Pa.

"Fibrocystic Disease of the Pancreas, and Its Relation to Pulmonary Suppuration,"

Joseph P. Atkins, M.D., F.C.C.P., Philadelphia, Pa.

"Bronchoscopic Examination in the Newborn,"

Clyde Heatly, M.D., Rochester, N. Y.

"Tracheal and Bronchial Obstruction due to Cardiovascular Anomalies,"

Paul H. Holinger, M.D., F.C.C.P., Chicago, Illinois.

"Bronchospirography,"

Charles Norris, M.D., F.C.C.P., Philadelphia, Pa.

"Hiatal Hernia of the Esophagus,"

F. Johnson Putney, M.D., Philadelphia, Pa.

"Syphilitic Tumor of the Bronchus,"

Archibald R. Judd, M.D., F.C.C.P., Hamburg, Pa.

"The Present Status of Broncho-Esophagology in Latin America,"

Chevalier L. Jackson, M.D., F.C.C.P., Philadelphia, Pa.

"Reconstruction Surgery of the Trachea,"

William P. Longmeier Jr., M.D., Baltimore, Md.

"Streptomycin Therapy in Tracheal and Bronchial Tuberculosis,"

John J. O'Keefe, M.D., Philadelphia, Pa.

"Rhinoscleroma of the Bronchus,"

Ricardo Tapia, M.D., F.C.C.P., Mexico City, Mexico.

"Allergic Manifestations of Pulmonary Disease,"

Francis W. Davison, M.D., Danville, Pa.

"Hemoptysis due to Chronic Mediastinal Venous Obstruction,"

Stanton A. Friedberg, M.D., Chicago, Illinois.

"Granuloma of the Larynx due to Intratracheal Anesthesia,"

Frederick T. Hill, M.D., Waterville, Maine.

Members of the profession are cordially invited to attend the meeting.

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JOURNAL "TUBERCLE" ADOPTED BY BRITISH  
TUBERCULOSIS ASSOCIATION

Members of the College everywhere will be interested to learn that the Tuberculosis Association in London, England, has made known the fact that its members have unanimously agreed to adopt the medical journal "TUBERCLE" as the official organ of the Association. Inquiries regarding this publication should be addressed to the Association at: Manson House, 26 Portland Place, London, W. 1., England.

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DR. SCHEELE TO SUCCEED DR. PARRAN AS SURGEON GENERAL

The White House has announced the nomination of Dr. Leonard A. Scheele as Surgeon General of the U. S. Public Health Service, to succeed Dr. Thomas Parran when the latter's term expires April 6, 1948.

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ILLINOIS CHAPTER

The Illinois Chapter of the College will hold its annual meeting in Chicago on May 10, at the time of the annual meeting of the state medical society. There will be a business meeting followed by a dinner to which a guest speaker has been invited. The following members of the College will present papers in the scientific session of the Illinois State Medical Society meeting:

"Detection of Various Chest Lesions by Mass X-Ray Surveys,"

Dan W. Morse, M.D., F.C.C.P., Peoria, Illinois.

"Recent Techniques in the Management of Bronchial Infections,"

Edwin R. Levine, M.D., F.C.C.P., Chicago, Illinois.

"The Present Status of Streptomycin,"

Karl H. Pfuete, M.D., F.C.C.P., Cannon Falls, Minnesota.

## ROCKY MOUNTAIN CHAPTER

The Rocky Mountain Chapter of the College and the Denver Sanatorium Association will hold a mid-winter meeting at the Lutheran Sanatorium, Wheat Ridge, Colorado, on Tuesday, March 23. The program for this combined meeting will be as follows:

## Report of Cases:

"Pulmonary Resection Following Thoracoplasty Complicated by Tuberculous Empyema,"

"Tuberculous Bronchitis Complicated by Atelectasis, Treated with Streptomycin,"

John A. Cremer, M.D., F.C.C.P., Denver, Colorado.

"Observations on Concurrent Disease and Tuberculosis,"

M. Stein, M.D., Denver, Colorado.

"Surgical Treatment of Chronic Lung Abscess,"

Captain A. J. Neerken, MC, U.S.A., Denver, Colorado.

"Report on Streptomycin Research at Fitzsimons General Hospital,"

Captain Jack Durrance, MC, U.S.A., Denver, Colorado.

"Surgical Treatment of Tuberculous Empyema,"

Fred R. Harper, M.D., Denver, Colorado.

"Bronchial Asthma,"

Frank T. Joyce, M.D., Denver, Colorado.

"Sympathectomy in Asthmatic Bronchitis,"

John B. Grow, M.D., F.C.C.P., Denver, Colorado.

"Psychiatric Problems in the Chronically Ill,"

Lewis Barbato, M.D., Denver, Colorado.

"Pulmonary Function Studies as a Practical Aid to Chest Surgery,"

Sidney H. Dressler, M.D., Denver, Colorado.

"Fungus Infection in the Rocky Mountain Area: A Roentgenographic and Skin Testing Survey,"

Frank Cline Jr., M.D., Fort Logan, Colorado.

A complimentary luncheon will be given at which the guest speaker, Dr. F. Jensen, Director of Graduate and Postgraduate Medical Education, Colorado University School of Medicine, will talk on "Current Concepts of Graduate Education as Applied to Pulmonary Diseases."

## THE NATIONAL BLOOD PROGRAM

The procurement of sufficient whole blood to meet the ever increasing demand for blood is one of the major problems confronting the medical profession today. Doctors and hospitals are apprehensive—even desperate. Neither nature nor science offers a substitute for human blood. It cannot be compounded or manufactured as are medical supplies and drugs. Nor can blood be purchased commercially and distributed in the amounts needed without costs that are beyond the resources of the vast majority of the people. The operation of blood banks by the individual hospitals is limited in application and cannot be expected to meet the national needs. It is only by the procurement and distribution of blood on a large scale that costs can be lowered and the quantities necessary be provided.

The National Blood Program of the American Red Cross is now being organized to provide sufficient blood and blood derivatives, without charge, to the entire nation to help save lives and meet the ever increasing demands for whole blood. Prior to its adoption the program was discussed with and approved in principle by the American Medical



Association, the American Hospital Association and the Catholic Hospital Association.

As a beginning, there will be one National Blood Program center located in each of the 5 Red Cross areas and one at national headquarters. An additional 20 to 25 centers, located at key points throughout the country, are scheduled for opening in 1948. Other centers will be established as rapidly as possible.

Since people in rural districts require blood as well as those in cities the program must be sufficiently flexible to meet widely varying conditions and needs in large and small communities throughout the country. It is the ultimate goal to collect blood from volunteers from every community everywhere and to give every healthy person an opportunity to make a contribution at least once a year.

The entire program will be financed by the American Red Cross.

This tremendous project, which will require approximately 5 years to put into complete operation, merits and needs the utmost support and active cooperation of every physician in the nation.

Dr. Harold B. Kenton, Blood Bank,  
New England Deaconess Hospital, Boston, Massachusetts.

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#### HEART DISEASE AND CANCER CAUSE MOST DEATHS IN THE U. S. A.

The experience of the Mutual Life Insurance Company of New York, according to a study made public of the causes of death among its 1,000,000 policyholders in 1947, is as follows:

	All Ages	Under 40	40-59	60 & Over
Diseases of Heart and Circulatory System	57.3%	14.6%	53.8%	61.9%
Cancer	14.6	11.4	15.8	14.4
Accidents	5.0	35.7	6.3	2.1
Disease of the Kidneys	3.6	2.9	2.7	4.1
Influenza and Pneumonia	3.6	3.1	2.8	4.0
Suicide	1.6	6.2	3.0	.7
Tuberculosis	1.0	3.7	1.5	.6
All other causes	13.3	22.4	14.1	12.2

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## Obituaries

### MAX PINNER

1891 - 1948



Max Pinner was born in Berlin at a time (November 28, 1891), when one scientific achievement after the other was being announced, many of which were made in or near his native land. Only nine years before, Koch had announced the discovery of the tubercle bacillus, and one year before had prepared tuberculin. In 1890 it was reported that there were two distinct types of tubercle bacilli, namely, the human and the avian. In 1896 Theobald Smith, of Harvard University, proclaimed that he had isolated a third, the bovine

type of tubercle bacillus. Forlanini, of Italy, had introduced the modern practice of artificial pneumothorax in 1888. Roentgen, of Germany, presented the x-ray in 1896, and Kilian of the United States, invented the bronchoscope in 1898. Their world renowned discoveries and many others made within less than ten years before and after the birth of Max Pinner must have been the subjects of frequent conversation and discussion in many households and wherever people were assembled for any purpose. As Max became conscious of the world about him, he must frequently have listened to recitations concerning these scientific achievements and later participated in the discussions himself. Thus, he early became imbued with scientific information and particularly with that pertaining to tuberculosis. Most likely all of this played an important part in his decision to study medicine. His medical studies were interrupted by World War I, when he served with the German army medical corps from 1915 to 1919. However, in 1920 he received the degree of Doctor of Medicine from Tübingen University. He became voluntary assistant at the Rudolph Eppendorfer Krankenhaus in Hamburg. He had a keen interest in tuberculosis so he knew of the fine work of E. L. Trudeau in establishing the Adirondack cottage sanitarium; that of Theobald Smith, who isolated the bovine type of tubercle bacillus; that of M. P. Ravenel who proved that the bovine type of tubercle bacillus is pathogenic for man. He knew about the fine accomplishments of the National Tuberculosis Association and the American Sanatorium Association and their component societies. He knew of the fine sanatorium building program in America. Probably the great opportunities he saw for accomplishments in tuberculosis control work in the United States influenced him to come here. In any event, he arrived in 1921. He began work in the Chicago Municipal Tuberculosis Sanitarium, where he received excellent instruction and help from Dr. Henry Sweany and other members of the medical staff. He then went to Detroit and worked in the Maybury Sanatorium and the Herman Kiefer Hospital. Here he

received fine instruction and support from the various physicians in tuberculosis and, particularly, Dr. Bruce Douglas. Dr. Pinner so won the admiration of Dr. Allen K. Krause of the Johns Hopkins School of Medicine that when he accepted the directorship of the Desert Sanatorium at Tucson, Arizona in 1929, he invited Dr. Pinner to join the staff. Here they worked together in the development of the institution. When Dr. Krause resigned from the Desert Sanatorium, Dr. Pinner accepted a position as diagnostic pathologist for the tuberculosis hospitals of the New York State Department of Health in 1935. Three years later he became head of the division of pulmonary diseases of the Montefiore Hospital in New York City and was also made clinical professor of medicine at Columbia University.

In his early association with Dr. Allen Krause, Dr. Pinner aided considerably with the *American Review of Tuberculosis*. As Dr. Krause's health began to fail this work increased, and he was made associate editor in 1937 and advanced to the editorship after Dr. Krause's death in 1941. When the *American Review of Tuberculosis* was founded by the National Tuberculosis Association in 1917, Dr. Edwin R. Baldwin of Saranac Lake, New York was chosen as editor-in-chief. However, in 1922 Dr. Krause of Baltimore was induced to take the editorship, but Dr. Baldwin remained on the Editorial Board until his death on May 6, 1947. Under the editorship of Dr. Baldwin and Dr. Krause the *American Review of Tuberculosis* became one of the finest publications of its kind in the entire world. During the ten years that he was associate editor and editor, Max Pinner maintained the high standards established by his predecessors.

There has been a friendly relationship between the *American Review of Tuberculosis* and *Diseases of the Chest*. Indeed, on more than one occasion the editors of these journals discussed their mutual problems and how they could best be solved. Each journal received definitely more manuscripts than it could possibly publish. Therefore, the one recognized the need for the other. As a Fellow of the American College of Chest Physicians, Dr. Pinner took pride in the official organ, *Diseases of the Chest*. As a former member of the Editorial Board of the *American Review of Tuberculosis* and an active member of both the National Tuberculosis Association and the American Trudeau Society, the editor of *Diseases of the Chest* takes a great deal of pride in the fine attainments of the *American Review* and the organizations it represents.

In addition to his usual duties Max Pinner was always ready to participate in other helpful projects. For example, in 1932 he and Mrs. Pinner translated from German, Koch's original paper announcing the discovery of the tubercle bacillus which was read before the Physiological Society in Berlin on March 24, 1882 and was published the same year. This translation was a splendid contribution to English-speaking physicians everywhere.

Only last year, in the preparation of a volume entitled "Classics on Tuberculosis," by Dr. Allen K. Krause, Dr. Pinner gave me a great deal of help in selecting the writings of Krause which seemed most suitable for publication in such a volume. Moreover, he cheerfully gave permission to reprint some of Krause's articles which had originally appeared in the *American Review*, as he had so often done before and since when requests were made to borrow illustrations and other materials which had been published in the *Review*.

Dr. Pinner wrote many fine articles which were published in various

medical and scientific journals. These contained the results of his investigations which contributed to our knowledge of tuberculosis. His editorial on "Primary Infection" which appeared in the October 1947 issue of the *Review* is a splendid and thought-provoking discussion of the subject. His book entitled *Tuberculosis in the Adult*, presents the various phases of the subject exactly as he saw them. The introduction describes how he attempted to write a different kind of book on tuberculosis than had previously been published. He had a magnificent literary style which, together with his thoughts on the subjects presented, made the book exceedingly worthwhile and popular. Although he was revising it at the time of his death, it can be read as it now stands with great profit for many years. His distinguished contributions to the tuberculosis field were recognized everywhere and culminated in the award of the Trudeau Medal of the National Tuberculosis Association in 1946.

Dr. Pinner was a member of all of the medical and scientific associations and societies in the fields of pathology, bacteriology, tuberculosis and closely associated subjects. Throughout his life Dr. Pinner was an ardent worker. He did every job well, whether it be teaching, writing, investigating, or examining patients.

Upon developing a serious heart condition in 1946, Dr. Pinner resigned his New York positions and moved to Berkeley, California. The offices of the *American Review of Tuberculosis* were also transferred to that location. There he continued to edit the *Review* until his death on January 7, 1948. He will be greatly missed, but his immediate survivors, as well as those of future generations, will be benefited by his contributions.

Jay Arthur Myers, M.D., Minneapolis, Minnesota.

### SAMUEL HUMES WATSON

1877 - 1948

Dr. Samuel Humes Watson, nationally known for his pioneering work in tuberculosis and allergies, died in his home in Tucson, Arizona, on February 5. Dr. Watson was born in Vinton, Iowa and attended schools in his birthplace and then went to Cornell College at Mt. Vernon, Iowa, later transferring to Rush Medical College in Chicago from which he was graduated in 1899. He began his career as a practicing physician at Blainston, Iowa, but moved to Tucson in 1911 after his health had failed. He began practicing in Tucson shortly after arriving there and continued active work until June 1947, when he became ill.

Dr. Watson was medical director of the Tucson Arizona Sanatorium from 1912 to 1918, and had been a member of the medical staff at St. Mary's Hospital and Sanatorium, and physician in chief at Barfield's Sanatorium, St. Luke's In-The-Desert, and at Anson's Rest Home, throughout the years. In 1922 Dr. Watson, together with Dr. Meade Clyne and the late Dr. Charles S. Kibler, formed the Tucson Clinic.

In 1928-29 Dr. Watson was president of the Arizona State Medical Association, and had also served as president of the Arizona Anti-Tuberculosis Association and the Pima County Medical Society. He was active in the Southwest Medical Association. Dr. Watson was a Fellow of the American College of Chest Physicians, the American College of Physicians and the American Medical Association.

Howell Randolph, M.D., Governor for Arizona.



**PHILIPP SCHONWALD**

1880 - 1947

Dr. Philipp Schonwald, a fine physician, scientist, and humanitarian, was born and educated in Vienna. His training was not only medical but also cultural. He mastered six languages, wrote and directed operettas and was a skillful violinist. In 1921 an uncle, who had traveled extensively in the United States, described to him the Pacific Northwest as "God's Own Country." This tale so fascinated him that he decided to move to Seattle where he could enjoy the fields, streams, and mountains while pursuing his medical career as a chest specialist.

During 26 years' practice in Seattle, Dr. Schonwald served on the staffs of the Riverton, Morningside and Swedish Hospitals and was the author of numerous papers on diseases of the chest. He was one of the original investigators on the allergic factor of soil bacteria and an early investigator on allergies traceable to mold spores. In November 1943, when life-saving penicillin was denied to civilian populations because of wartime demands of the military, Dr. Schonwald developed a substitute that won him world fame.

Dr. Schonwald was a member of the American Medical Association, King County and Washington State Medical Societies, and a Fellow of the American College of Chest Physicians, American Academy of Allergists, American Trudeau Society and the American College of Physicians.

Death came to Dr. Schonwald at his home in Seattle on December 27, 1947. His life's accomplishments are an inspiration to all who desire to give so that this may be a better world.

John E. Nelson, M.D., Governor for Washington.

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**FRANK TRUMBO HARPER**

1909 - 1947

On July 4, 1947, while taking off at the Burlington Airport in a small cabin plane, Dr. Frank Trumbo Harper, age 38, was instantly killed. The plane piloted by a friend went into a "power stall" and both occupants met death in the accident.

Dr. Harper, a native of Kinston, N. C., was graduated at the Medical College of Virginia in 1934. Having contracted tuberculosis himself, he became especially interested in that disease and spent several years at State Sanatorium under the tutelage of the late Dr. P. P. McCain and at the Jamestown Sanatorium with Dr. M. D. Bonner.

Locating in Burlington in 1941, Bo Harper, with his innate ability and thorough training in internal medicine and tuberculosis, with his versatile leadership, affable disposition and hard work, soon built up a large practice. Being a member of several Medical Associations, he contributed numerous original papers on the programs of these organizations. He was active in two civic clubs, Chamber of Commerce, Boy Scouts, Tuberculosis Association, Cancer Control Committee and for several years was director of the Alamance County Tuberculosis Sanatorium. Largely through Dr. Harper's efforts a portable x-ray unit for County-wide chest examinations was purchased just before his untimely death. Over \$25,000.00 has recently been donated to the Bo Harper Memorial Fund—to further the work in tuberculosis for which he had given so freely of his time and energy.

Burlington and Alamance County and the State of North Carolina will continue to miss Bo Harper—whose tragic end came in the prime of life when men of his type are so greatly needed. His widow and three daughters reside in Burlington, N. C., and his mother, brother and sister in Kinston, N. C.

M. D. Bonner, M.D., Governor for North Carolina.

#### MANUSCRIPT SERVICE ANNOUNCED

The establishment of a manuscript service has been announced, which is an organization devoted to ethical editorial service in the field of medicine and allied sciences. The name of the firm is Manuscript Service, Inc., and the address is 6432 Cass Avenue, Detroit, Michigan.

Manuscript Service, Inc. has been organized to facilitate publication of clinical and experimental research, case records and historical reviews by providing ethical editorial assistance for authors who do not have adequate library facilities available, those who do not have sufficient contact with the publishing field, and those whose time is limited. The service is directed by an editor with many years of experience in the preparation and publication of papers and books concerned with the clinical diagnosis and therapy, surgery, nutrition, psychiatry, mental hygiene, dentistry, anthropometry, roentgenology, physiology and biochemistry.

#### SUMMARY OF TUBERCULOSIS SERVICE IN THE UNITED STATES

	Hospitals	Beds	Admissions
Federal	23	8,536	16,778
State	77	26,862	22,313
County	180	23,577	22,417
City	25	10,192	19,357
City-County	15	2,242	2,067
Church	21	2,524	4,173
Nonprofit	79	7,635	9,640
Individual and Partnership	20	803	1,782
Corporations	10	816	1,214
<b>TOTAL</b>	<b>450</b>	<b>83,187</b>	<b>99,741</b>

Tuberculosis sanatoriums, which can accommodate 83,187 patients, showed an increase of 4,413 beds in 1946. These figures, however, do not include the tuberculosis facilities that are regularly available in many of the general and psychiatric hospitals as well as other institutions. Eighty five per cent of the beds in tuberculosis hospitals will be found in institutions operating under government control. In summary, it may be noted that the general, psychiatric and tuberculosis hospitals as a group have 95.3 per cent of all registered hospital beds.

\*Abstracted from "Hospital Service in the United States," 1947, 26th Presentation of Hospital Statistics by the Council on Medical Education and Hospitals of the American Medical Association.

